2006

Three essays on corporate acquisitions, bidders' liquidity, and monitoring

Huihua Li
Louisiana State University and Agricultural and Mechanical College, hli2@lsu.edu

THREE ESSAYS ON CORPORATE ACQUISITIONS, BIDDERS' LIQUIDITY, AND MONITORING

A Dissertation

Submitted to the Graduate Faculty of the
Louisiana State University and
Agriculture and Mechanical College
In partial fulfillment of the
Requirements for the degree of
Doctor of Philosophy

In

The Interdepartmental Program in Business Administration (Finance)

by
Huihua Li
Bachelor, FuDan University, 1997
Master, FuDan University, 2000
M.S., Louisiana State University, 2004
August, 2006

Acknowledgements

I would like to express my most sincere gratitude and appreciation to my committee chair, Dr. Harley Ryan, for his inspiration, guidance, encouragement and support throughout my Ph.D. study in LSU. I am also deeply indebted to my committee members, Dr. Ji-Chai Li, Dr. Gary Sanger, Dr. William Lane and Dr. Sudipta Sarangi for their valuable comments and helpful suggestions. Special thanks also go to other faculty members and staff in the Department of Finance.

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Abstract

This dissertation consists of three essays on corporate acquisitions, bidders' liquidity and monitoring. In the first essay, "Acquisitions and Bidders' Liquidity: Evidence from Successful and Unsuccessful Takeovers", I examine the impact of corporate acquisitions on bidders' liquidity. I find that liquidity improves for bidders that complete the takeovers but remains unchanged or decreases for unsuccessful bidders. Takeovers of public firms result in similar liquidity improvements as do takeovers of private firms. Takeovers that use stock as the method of payment have significantly more improvement in liquidity than takeovers that use cash as the payment method. These results suggest that changes in firm characteristics provide the primary impetus for liquidity improvements following acquisitions. They also support the premise that bundling two publicly held claims reduces the information advantage of informed traders.

In essay two**, "**Liquidity and Market Monitoring: An Examination of Changes in Market Monitoring for Successful Bidders", I use takeover as a liquidity-changing event to examine empirically the relation between liquidity and monitoring of the firm. Dividing acquisitions into liquidity-improved and liquidity-decreased groups, I find that the Hasbrouck (1993) pricing error decreases significantly for the liquidity-improved bidders but increases significantly for the liquidity-decreased bidders. This evidence suggests that price becomes more (less) informative for the liquidity-improved (decreased) bidders and therefore provides greater incentives for outsiders to monitor the firm. Consistent with improved monitoring, I find that the liquidity-improved bidders have better operating performance and higher firm value than the liquidity-decreased bidders.

In essay three, "Liquidity and Corporate Governance: An Examination of Changes in Corporate Governance for Successful Bidders", I examine empirically the influence of liquidity

on a firm's corporate governance. I find that compared to the liquidity-decreased bidders, executives for the liquidity-improved bidders have significantly larger size- and industry-adjusted increases in cash and total compensation after the acquisitions. The pay-for-performance sensitivity of executive compensation decrease significantly for the liquidity-improved bidders. These results support the proposition that an improvement in liquidity results in a more informative stock price that enables a firm to write more efficient contracts.

Chapter 1 Introduction

My dissertation examines how corporate acquisitions influence bidders' liquidity and how changes in liquidity impact bidders' external and internal monitoring. This dissertation is an attempt to link corporate finance and market microstructure together. Both corporate finance and market microstructure have drawn plenty of attention in the finance area, however, the relation between corporate finance and market microstructure has been largely unexplored. My dissertation tries to fill in this void.

My dissertation consists of three essays. The first essay examines the impact of corporate acquisitions on bidders' liquidity. The second essay examines the impact of changes in liquidity on bidders' external monitoring and the third essay examines the impact of changes in liquidity on bidders' managerial compensation and corporate governance.

Acquisitions create changes in firm characteristics and produce new information about the firm. Theories suggest that both firm characteristics and information generation can affect a firm's liquidity in the stock market. In the first essay, "Acquisitions and Bidders' Liquidity: Evidence from Successful and Unsuccessful Takeovers", I examine the impact of corporate acquisitions on bidders' liquidity. I find that liquidity improves for bidders that complete the takeovers but remains unchanged or decreases for unsuccessful bidders. Takeovers of public firms result in similar liquidity improvements as do takeovers of private firms, but takeovers of public firms have greater reduction in information asymmetry than takeovers of private firms. Takeovers that use stock as the method of payment have significantly more improvement in liquidity than takeovers that use cash as the payment method. These results suggest that changes in firm characteristics provide the primary impetus for liquidity improvements following acquisitions. They also support the premise that bundling two publicly held claims reduces the

information advantage of informed traders, which improves liquidity by lowering adverse selection costs faced by market makers.

In essay two**, "**Liquidity and Market Monitoring: An Examination of Changes in Market Monitoring for Successful Bidders", I use takeover as a liquidity-changing event to examine empirically the relation between liquidity and monitoring of the firm. Holmstrom and Tirole (1993) argue that as a firm's liquidity improves the marginal value of information about the firm increases and the informed investors have a stronger incentive to monitor the firm since they are more likely to benefit from their actions. Dividing acquisitions into liquidity-improved and liquidity-decreased groups, I find that the Hasbrouck (1993) pricing error decreases significantly for the liquidity-improved bidders but increases significantly for the liquidity-decreased bidders. This evidence suggests that price becomes more (less) informative for the liquidity-improved (decreased) bidders and therefore provides greater incentives for outsiders to monitor the firm. Consistent with improved monitoring, I find that the liquidity-improved bidders have better operating performance and higher firm value than the liquidity-decreased bidders.

In essay three, "Liquidity and Corporate Governance: An Examination of Changes in Corporate Governance for Successful Bidders", I examine empirically the influence of liquidity on a firm's corporate governance. I find that compared to the liquidity-decreased bidders, executives for the liquidity-improved bidders have significantly larger size- and industry-adjusted increases in cash compensation and total compensation after the acquisitions. The pay-for-performance sensitivity of executive compensation, measured as the incentive-intensity of stock option awards and the mix of stock option award to cash compensation, decrease significantly for the liquidity-improved bidders. These results support the proposition that an improvement in liquidity results in a more informative stock price that

enables a firm to write more efficient contracts. They are also consistent with the premise that a more informative price system improves firm transparency, which reduces the need to make pay sensitive to stock-price performance.

Chapter 2 Acquisitions and Bidders' Liquidity: Evidence from Successful and Unsuccessful Takeovers

2.1 Introduction

Financial theory suggests that the liquidity of a firm's shares in the financial markets directly and indirectly influences firm value. Although many studies find relations between firm characteristics (e.g., size) and market liquidity, how liquidity changes following decisions that alter the characteristics of the firm remains relatively unexplored. In this essay, I propose that the acquisition of another firm will affect liquidity. To test this proposition, I examine successful takeovers and unsuccessful takeover attempts of public and private firms. On average, I find that liquidity improves for successful takeovers only. Takeovers of public firms and private firms both result in liquidity improvements for the bidders, but takeovers of public firms lead to greater reduction in adverse selection problems. Bidders that use stock as a method of payment have more improvements in liquidity than bidders that use cash as a method of payment. These results suggest that changes in firm characteristics (increases in firm size, for example), and not information produced during the acquisition process, provide the primary impetus for liquidity improvement. The findings support the premise that bundling two publicly held claims reduces the information advantage of informed traders, which improves liquidity by lowering adverse selection costs faced by market makers. In addition, the results with respect to method of payment support Merton's (1987) proposition that an increase in the firm's investor base improves the firm's liquidity.

The liquidity of a firm influences firm value for several reasons. First, investors maximize expected returns net of transaction costs, and in equilibrium they require higher returns to hold stocks with higher transaction costs. Therefore, a more liquid firm has a higher market value (e.g., Amihud and Mendeson, 1986; Brennan and Subrahmanyam, 1996). Second, higher

liquidity lowers the cost of capital of a firm, and as a result expands the growth opportunities available to the firm. Recognizing this fact, Arthur Levitt, former chairman of the SEC, recommends high quality accounting standards because they can "improve liquidity [and] reduce capital costs" (Easley and O'Hara, 2004). Third, higher levels of liquidity allows informed traders to gain greater profits on their information (Kyle, 1985), and therefore provides greater incentives for investors to gather information and monitor the firm (Holmstrom and Tirole, 1993). Presumably, more monitoring will lead to better managed and more valuable firms.

Despite the importance of liquidity to firm value, researchers have provided scant empirical evidence on the relation between decisions in the firm and changes in liquidity. One exception is a paper by Lipson and Mortal (2003), who find that the bidder's liquidity improves after the successful takeover. However, they cannot determine the reason of the liquidity improvement for the bidders. Financial theories suggest that both the information generated during the takeover process and the changes in firm characteristics can drive the liquidity improvement for the bidder. Although Lipson and Mortal suggest that firm characteristics influence the changes in liquidity, they cannot rule out the possibility that information generated during the takeover process causes the changes in liquidity.

Corporate acquisitions can influence bidders' liquidity in at least two ways. First, corporate acquisitions generate more public information for the bidders. Bidders make more disclosures and attract more investor attention during the acquisition process. I refer to this premise as the *information production hypothesis*. Diamond (1985) argues that public information improves liquidity and makes all traders better off by reducing the need for individuals to gather information. Hasbrouck (1991) argues that public information improves liquidity because private information is the advance knowledge of public information, and better public disclosure reduces

the influence of private information. Second, the bidder of a successful takeover incurs changes in firm characteristics that can affect its liquidity. I refer to this proposition as the *firm characteristics hypothesis*. For example, a successful takeover bundles the claims on two individual firms together. Subrahmanyam (1991), and Gorton and Pennacchi (1993) show that the adverse selection problem is typically lower in a basket of securities. The decrease in the adverse selection cost will lead to an improvement in liquidity. In addition, after the takeover, the bidder increases in firm size. A larger firm usually has more trading volume and more analysts, which results in lower information asymmetry and higher liquidity.

To distinguish between these hypotheses, I examine a sample of both successful and unsuccessful takeovers. Unsuccessful takeover attempts, like successful acquisitions generate information during the takeover process, but they do not change the characteristics of the firm. I find that during the takeover process, changes in analysts' coverage (forecast accuracy, dispersion of forecasts, and number of news produced) of successful bidders are not significantly different from those of unsuccessful bidders. However, liquidity improves for successful bidders, but not for unsuccessful bidders. Altogether, these results suggest that changes in bidders' characteristics, such as bundling two claims or an increase in size, drive the liquidity improvement for successful bidders.

In my univariate analysis, I find that bidders that acquire private firms enjoy a similar magnitude of liquidity improvements as do bidders that acquire public firms. However, after controlling for other factors such as changes in the number of market makers or the size of the deal, I find that bidders that acquire public firms have significantly greater improvements in liquidity than bidders that acquire private firms. Furthermore, bidders that acquire public firms experience greater reduction in the adverse selection problem measured as PIN (the probability

of information-based trading) than do bidders that acquire private firms. This evidence lends support to the firm characteristics hypothesis. In my sample, the relative size of the target to the bidder is significantly greater for bidders that acquire public firms. After the successful completion of takeovers, bidders that acquire public firms increase more (both in absolute terms and in relative terms) in size than do bidders that acquire private firms. Larger firms tend to attract more analysts' and have more trading volume, which decreases the adverse selection (improves liquidity) for larger firms.

I find that successful bidders that use stock as a method of payment have significantly more improvement in liquidity than successful bidders that use cash as a method of payment. Merton (1987) argues that an increase in the investor base improves the firm's liquidity. It is likely that a bidder that uses stock as a method of payment in the acquisition will increase its investor base since at least some of the shareholders in the acquired firm, who do not own shares in the acquiring firm prior to the acquisition, will hold onto their shares afterward. Assuming that this is the case, the result for stock payment appears to support Merton's prediction.

Changes in liquidity for bidders that acquire firms in unrelated businesses do not appear to be different from liquidity changes for bidders that make related acquisitions. If an acquisition of an unrelated firm reduces the information advantage of informed traders in the combined firm, this finding fails to support the bundling of claims predictions of Subrahmanyam (1991), and Gorton and Pennacchi (1993). However, it is plausible that investors are well informed about all public firms, which reduces the power of this test. Similarly, investors could be poorly informed about all private firms, which again would reduce the power of the test.

The rest of the paper is organized as follows. Section 2 discusses the hypotheses of the paper. Section 3 describes the data and the methods I use in the tests. Section 4 presents the empirical results and Section 5 concludes.

2.2 Hypothesis

2.2.1 Successful Takeovers and Liquidity

Financial theories suggest two opposing effects of a successful takeover on the bidder's liquidity. Following Huson and MacKinnon (2003), I develop these two competing hypotheses.

I first identify several reasons that corporate acquisitions improve bidders' liquidity. First, a corporate acquisition changes a bidder's firm characteristics. On one hand, a corporate acquisition bundles claims on two individual assets together. Security design literature suggests that the information asymmetry problem decreases in a basket of securities. Subrahmanyam (1991) and Gorton and Pennacchi (1993) argue that informed investors, who have private information on one particular security, become less informed when facing a basket of securities. Their argument implies that when a bidder becomes more diversified through a takeover, the informed investors lose their information advantage and the information asymmetry among investors of the bidder decreases. On the other hand, a successful acquisition leads to an increase in the bidder's size. A larger company usually has lower information asymmetry and higher liquidity because it typically attracts more analysts, has more press coverage and has higher trading volume.

Second, a bidder attracts more attention and generates more public information during the acquisition process. Diamond (1985) argues that public information improves liquidity and makes all traders better off because it reduces the need for individuals to gather information.

Hasbrouck (1991) argues that private information is the advance knowledge of public information and public disclosures reduces the impact of private information.

It is also likely that a successful takeover might decrease the bidder's liquidity. The bidder generates public information during the acquisition process. Huson and MacKinnon (2003) hypothesize that public information could increase information asymmetry. They hypothesize that public information complements informed investors' private information, and informed investors gain an even higher information advantage with better public information. On the other hand, when firms with separate market prices combine into one firm with only one market price (e.g., acquiring a public firm), the new single price does not provide investors with the same level of information as two separate prices. This less informative price exacerbates the information asymmetry among investors and decreases the bidder's liquidity.

2.2.2 Unsuccessful Takeovers and Liquidity

Similar to successful bidders, unsuccessful bidders attract investor attention and generate more public information during the takeover process. However, because their takeover attempts finally fail, unsuccessful bidders do not incur changes in firm characteristics, such as bundling claims together or increasing in firm size. I identify three possible effects of a takeover attempt on unsuccessful bidders' liquidity.

First, if the information generated during the acquisition process influences bidders' liquidity and if private information is the advance knowledge of public information, then more public information improves liquidity (Hasbrouck 1991; Diamond 1985), and unsuccessful bidders enjoy liquidity improvements. Second, if the information generated during the acquisition process influences bidders' liquidity but public information only serves to complement investors' private information, then unsuccessful bidders incur decreases in liquidity

after their takeover attempts fail. Third, if the information generated during the acquisition process has no effect on bidders' liquidity, takeover attempts will have no effect on unsuccessful bidders' liquidity.

2.3 Data

I collect from the Securities Data Corporation's (SDC) Mergers and Acquisitions (M&A) Database a list of successful and unsuccessful mergers and tender offers for domestic targets, with the initial bid announced between April 1st, 1995 and December 31st, 2001.[1] To be included in the analysis, an acquisition must meet the following criteria. (1) The announcement date and the effective/withdrawal date of the takeover can be verified through the Lexis/Nexis; (2) The bidder is a U.S. firm listed on the NYSE, AMEX or NASDAQ; (3) The bidder has 300 days of return data on CRSP and 80 days of transaction data in the NYSE Trade and Quote Database (TAQ) before and after the announcement and effective/withdrawal date of the takeover; (4) The successful bidder acquires more than fifty percent and owns one hundred percent of the target firm's shares after the takeover; (5). The deal value is over 10 percent of the bidder's market value two weeks before the takeover announcement; (6). The firm does not attempt another takeover between its pre- and post- takeover event window; (7). The bidder's stock price is above three dollars; (8). The takeover does not have such confounding events as stock split, addition into and deletion from the market index. I obtain the analysts' data from the I/B/E/S. I collect the number of news data from Lexis/Nexis.

My final sample consists of 1552 successful takeovers and 516 unsuccessful takeover attempts.

[1] I use Cusip numbers to merge the data from SDC with data from CRSP and TAQ. I match by hand those firms that cannot be merged by Cusip number.

Table 1 presents the distribution and summary statistics of the successful takeover sample and the unsuccessful takeover sample from 1995 to 2001 respectively. Bidder size is the bidder's market value two weeks before the takeover announcement. Transaction value is the total value of consideration paid or attempt to be paid by a bidder, excluding fees and expenses. If the target is a publicly traded firm, I classify the takeover as a public takeover. If the target is a privately held firm, I classify the takeover as a private takeover[2]. If the target has the same first two-digit SIC code as the bidder, I classify the takeover as a related takeover. If the target does not have the same first two-digit SIC code as the bidder, I classify it as an unrelated takeover.

Panel A shows that both the successful and unsuccessful samples have the takeovers concentrated in year 1997 to 1999, and both of them have the fewest observations in year 2001. A comparison of the bidder size and the deal value shows that on average a successful bidder is larger and aims at a larger target than an unsuccessful bidder. However, the relative size of the target to the bidder is quite similar in both samples. The median bidder size and transaction value of the successful sample are 226 and 86 million dollars respectively, which are significantly greater than those of the unsuccessful sample. However, the relative size of the target to the bidder is 0.31 for the successful sample, only marginally significantly different from 0.40 for the unsuccessful sample.

Panel B and Panel E present the summary statistics of the sub-samples within the successful samples and the unsuccessful samples. Panel B and Panel D show that overall the bidder of a public takeover is larger and seeks to acquire a larger firm than the bidder of a private takeover, and that the relative size of the target to the bidder is significantly larger for a public takeover. In addition, Panel B shows that within the successful takeover sample, there are more private

[2] My sample also includes takeovers of subsidiaries, I include them in the full sample, but I do not examine them separately in this essay when I examine and compare changes for bidders that make private and public takeovers.

Table 1. Distribution Information and Summary Statistics

This table presents the distribution and summary statistics of the successful takeover sample and the unsuccessful takeover sample over the 1995 to 2001 period respectively. The bidder size is the bidder's market value two weeks before the takeover announcement. The transaction value is the total value of consideration paid (or attempted to be paid) by a bidder, excluding fees and expenses. If the target is a publicly traded firm, I classify the takeover as a public takeover. If the target is a privately held firm, I classify the takeover as a private takeover. If the target has the same first two digit SIC code as the bidder, I classify the takeover as a related takeover. If the target does not have the same first two digit SIC code as the bidder, I classify the takeover as an unrelated takeover. Both the bidder size and transaction value are in millions of dollars. All the numbers reported are medians.

Year	Number of Obs		Bidder Size			Transaction Value			Transaction Value/Bidder Size		
	Panel A. Full sample - Successful takeovers compared to unsuccessful takeovers										
	Success	Unsuccess	Success	Unsuccess	Diff	Success	Unsuccess	Diff	Success	Unsuccess	Diff
1995	143	53	207	157	50	64	54	10	0.29	0.34	-0.05
1996	214	78	177	94	83***	74	31	43***	0.30	0.34	-0.05
1997	262	106	239	151	88*	86	60	26*	0.30	0.40	-0.1
1998	300	84	208	144	64*	84	73	11	0.30	0.53	-0.23**
1999	268	73	300	404	-104	111	125	-14	0.32	0.41	-0.09
2000	216	71	280	388	-108	98	128	-30	0.31	0.45	-0.14
2001	149	51	421	764	-343**	107	194	-87	0.26	0.25	0.01
Total	1552	516	226	166	60***	86	67	19***	0.31	0.40	-0.09*
	Panel B. Successful takeovers – public compared to private										
	Public	Private	Public	Private	Diff	Public	Private	Diff	Public	Private	Diff
1995	43	57	507	99	408***	215	34	181***	0.32	0.27	0.05
1996	54	86	642	120	522***	271	31	240***	0.49	0.27	0.22***
1997	75	98	660	132	528***	366	34	332***	0.57	0.19	0.38***
1998	89	116	657	128	529***	399	31	368***	0.53	0.22	0.31***
1999	78	110	860	132	728***	458	36	422***	0.52	0.24	0.28***
2000	64	87	1015	128	887***	580	45	535***	0.38	0.24	0.14**
2001	43	54	1995	338	1657***	554	63	491***	0.35	0.17	0.18***
Total	446	608	736	126	610***	345	35	310***	0.48	0.23	0.25***

(Table 1 cont.)

Year	Number of Obs.		Bidder Size			Transaction Value			Transaction Value/Bidder Size		
					Panel C. Successful takeovers – related compared to unrelated						
	Related	Unrelated	Related	Unrelated	Diff	Related	Unrelated	Diff	Related	Unrelated	Diff
1995	98	45	212	200	12	70	57	13	0.30	0.29	0.01
1996	116	98	264	162	102	95	68	27	0.31	0.29	0.02
1997	161	101	221	254	-33	86	90	-4	0.31	0.29	0.02
1998	186	114	223	187	36	87	71	16	0.33	0.26	0.07
1999	170	98	307	273	34	128	79	49	0.32	0.32	0
2000	128	88	303	215	88*	132	90	42	0.32	0.28	0.04
2001	98	51	547	268	279***	152	82	70**	0.23	0.29	-0.06*
Total	972	595	243	197	46**	94	75	19***	0.32	0.29	0.03
					Panel D. Unsuccessful takeovers – public compared to private						
	Public	Private	Public	Private	Diff	Public	Private	Diff	Public	Private	Diff
1995	23	17	469	145	324*	128	27	101*	0.50	0.30	0.20
1996	34	31	203	45	158***	77	14	63***	0.56	0.23	0.33*
1997	51	39	577	40	537***	222	16	206***	0.51	0.31	0.20
1998	42	29	288	65	223***	201	18	183***	0.62	0.36	0.26
1999	49	15	454	16	438***	216	17	199***	0.46	0.48	-0.02
2000	42	19	718	60	658**	168	112	56**	0.51	0.42	0.09
2001	33	9	897	242	655	194	137	57	0.22	0.43	-0.21
Total	274	159	454	47	412***	174	18	158***	0.53	0.33	0.20**
					Panel E. Unsuccessful takeovers – related compared to unrelated						
	Related	Unrelated	Related	Unrelated	Diff	Related	Unrelated	Diff	Related	Unrelated	Diff
1995	29	24	151	220	-69	58	51	7	0.43	0.28	0.15
1996	45	33	236	54	182***	64	10	54***	0.36	0.33	0.03
1997	64	42	169	114	55	69	55	14	0.38	0.47	-0.09
1998	45	39	149	142	7	74	71	3	0.53	0.34	0.19
1999	47	26	572	101	471**	163	28	135**	0.41	0.43	-0.02
2000	33	38	705	109	596***	200	66	134***	0.63	0.34	0.29
2001	27	24	962	337	625	200	135	65	0.26	0.22	0.04
Total	290	226	277	104	173***	85	50	35***	0.44	0.34	0.10

takeovers than public takeovers. In the sample, there are 608 successful private takeovers but only 446 successful public takeovers. However, within the unsuccessful sample, there are more failed/withdrawn public takeovers than private takeovers. As Panel D demonstrates, in this sample, there are 159 unsuccessful private takeovers and 274 unsuccessful public takeovers.

Panel C and Panel E show that though the bidder of a related takeover is larger and aims at a larger target than the bidder of an unrelated takeover, the relative size of the target to the bidder is similar in both samples.

2.4 Methods

2.4.1 Changes in the Rate of Information Arrival

Kyle (1985) and Ross (1989) argue that a higher return volatility suggests a higher information arrival rate. Empirical evidence from tests of market efficiency lends support to this argument. Patell and Wolfson (1984) find that return volatility increases following releases of earnings/dividends news. Ederington and Lee (1993) find that return volatility increases at the scheduled macroeconomic news on interest rates. A corporate acquisition or an acquisition attempt changes the bidder's information environment and firm characteristics, which could lead to a change in its information arrival rate and influences the bidder's liquidity. To compare the information arrival rate for bidders before and after the acquisition, I follow the method suggested by Huson and MacKinnon (2003). I estimate the following regressions with daily data, and compare the standard deviation of its residuals for each bidder.

$$r_{it}^{pre} = \alpha_i^{pre} + \beta_i^{pre} r_{mt}^{pre} + \varepsilon_{it}^{pre}$$

$$r_{it}^{post} = \alpha_i^{post} + \beta_i^{post} r_{mt}^{post} + \varepsilon_{it}^{post}$$

where r_{it} is the daily stock return for a bidder and r_{mt} is the daily return for the CRSP value-weighted index. The pre-takeover period runs from 300 to 50 days before the takeover

announcement date and the post-takeover period runs from 50 to 300 days after the takeover effective/withdrawal date.

2.4.2 Microstructure Elements Analysis

I use several microstructure measures to measure liquidity and information asymmetry. In particular, the liquidity measures include the absolute and relative time-weighted quoted spreads, the time-weighted quoted depth, and the absolute and relative effective spreads. The information asymmetry measures include the price impact and the probability of information-based trading (PIN).

I focus the analysis on the transaction data of the exchange on which the firm is listed. As in Huang and Stoll (1996 and 1997), I restrict to the trades that are coded as regular for analysis. All prices and quotes must be positive, and ask price must be greater than bid price. Since NYSE opens as a call market and continues as a continuous auction market for the rest of the day, for NYSE-listed firms, I follow Lin, Sanger and Booth (1995) and exclude the first transaction on each day if it is not preceded by a quote.

The liquidity measures I use include the absolute and relative quoted spread, the absolute and relative effective spreads and depth. The absolute quoted spread (or the dollar spread) is the difference between the ask and bid prices. The relative quoted spread is the dollar spread divided by the quote midpoint. The quoted depth is the average of the ask and bid sizes for a quote. To account for the different length of time over which each quote is valid, I calculate the time weighted quoted spreads/depth as Hedge and McDermott (2003). The time-weighted quoted spread (depth) is the spread (depth) weighted by the length of time each quote is valid.

I measure the effective spread as twice the absolute value of the difference between the trade price and the prevailing quote midpoint. I calculate the relative effective spread as the

effective spread divided by the prevailing quote midpoint. Lee and Ready (1991) document that quotes may be recorded 5 or 6 seconds ahead of the trades that triggered them and they suggest using "a time-delayed quote" method to find the prevailing quote. However, Peterson and Sirri (2003) find that the power of effective spread as a proxy for transaction cost improves if trades are not lagged. Thus, I identify the prevailing quote without lagging the trades.

The information asymmetry measures I use include the price impact and the probability of information based trading.

Huang and Stoll (1997) argue that large orders are usually broken up as they are executed and they suggest collapsing a sequence of related trades to one order. I collapse the trades when I examine the information asymmetry measures. If a sequence of trades is executed at the same price on the same side of the market without any change in the quotes, I define this sequence as a single trade.

First, I use price impact to measure the information asymmetry problem. Trades can move prices when there is asymmetric information about the asset's value. The higher the information asymmetry the greater the price impacts of trades (Copeland and Galai 1983, Glosten and Milgrom 1985, Jones and Lipson 1999). Researchers usually calculate the price impact of a trade by comparing the prevailing quotes before a transaction to the quotes immediately after. Jones and Lipson (1999) demonstrate that on average, it takes several transactions for the eventual price impact to be incorporated into the quotes. Following Jones and Lipson (1999), I measure the price impact by comparing the quote midpoint immediately prior to a trade to the quote midpoint after 5 transactions. The price impact is calculated as the absolute value of the log of the quoted midpoint ratio:

$PI = abs(\ln \frac{MP_{t+i}}{MP_t})$, where i equals to 5.

Second, I use the probability of information-based trading (PIN) suggested by Easley, Hvidkjaer and O'Hara (2002) to measure the information asymmetry problem. Microstructure models can be viewed as a description of the game between the market maker and the traders. Market makers watch the data and update their beliefs about the information-based trading (for example, Kyle 1985). Market makers will widen the bid-ask spreads when they perceive more information-based trading. Therefore, PIN provides a reasonable proxy for the information asymmetry problem.

In Easley, Hvidkjaer and O'Hara (2002) model, at each trading day, there is a probability α of information arrival. This information can be bad news with a probability of δ, and good news with a probability of $1-\delta$. There are three kinds of traders in the market: uninformed buyers, uninformed sellers and informed investors. Orders from uninformed buyers (sellers) arrive at a rate of ε_b (ε_s) and orders from informed investors arrive at a rate of μ, and all of them obey Poisson Distributions. Informed investors sell when there is bad news and buy when there is good news. Following these assumptions, we can estimate α, μ, ε_b and ε_s by maximizing the following likelihood function

$$L(\theta \mid B,S) = (1-\alpha)e^{-\varepsilon_b}\frac{\varepsilon_b^{\,B}}{B!}e^{-\varepsilon_s}\frac{\varepsilon_s^{\,S}}{S!} + \alpha\delta e^{-\varepsilon_b}\frac{\varepsilon_b^{\,B}}{B!}e^{-(\mu+\varepsilon_s)}\frac{(\mu+\varepsilon_s)^S}{S!}$$

$$+ \alpha(1-\delta)e^{-(\mu+\varepsilon_b)}\frac{(\mu+\varepsilon_b)^B}{B!}e^{-\varepsilon_s)}\frac{\varepsilon_s^{\,S}}{S!},$$

and then calculate PIN as, $PIN = \dfrac{\alpha\mu}{\alpha\mu+\varepsilon_s+\varepsilon_b}$.

When calculating PIN, I classify trades as buys or sells using Lea and Ready (1991) method. If the trade price is higher (lower) than the prevailing quoted midpoint, I classify this trade as a buy (sell). If the trade price is same as the prevailing quoted mid-point, I use the "tick test" to

classify this trade. If a trade's price is higher (lower) than the previous trade, this trade is classified as an uptick (downtick). If a trade's price is the same as the previous trade, but the last price change is an uptick (downtick), this trade is classified as a zero-uptick (zero-downtick). A trade is a buy if it is an uptick or zero-uptick, otherwise it is a sell.

2.4.3 Information Production Hypothesis or Firm Characteristics Hypothesis

The *information production hypothesis* refers to the effect of the information produced during the takeover process on bidders' liquidity. It does not refer to the information produced after the takeover process. In contrast, all changes after the takeovers, including changes in the level of information produced for the bidders that result from the completed acquisition, are classified as changes in firm characteristics or changes related to firm characteristics. The f*irm characteristics hypothesis* examines the liquidity effects of both the changes in firm characteristics and the changes related to firm characteristics.

First, I examine the *information production hypothesis* - whether the information produced during the takeover process drives the liquidity changes for the bidders. I use the number of news stories as a proxy for information production and compare the number of news stories produced during the takeover process between the successful and unsuccessful bidders. If information production drives the change in liquidity, I expect bidders with more news stories to exhibit greater changes in liquidity. Particularly, if private information is essentially the advance knowledge of public information (Hasbrouck 1991), I expect to observe bidders with more news stories to enjoy greater improvements in liquidity. I also use analysts' coverage to measure information produced during the takeover process. In particular, I examine changes in analysts' coverage for the bidders during the takeover process and compare the differences between the successful and unsuccessful takeovers.

Second, I examine and compare changes in analysts' coverage between the successful and unsuccessful bidders after the effective/withdrawal date of the takeovers. This test could shed light on the *firm characteristics hypothesis*. Successful bidders have significant changes in firm characteristics after the takeovers. These changes in firm characteristics (such as increase in firm size) could influence the firm's analysts' coverage which then impacts the firm's liquidity. In contrast, unsuccessful bidders do not incur significant changes in firm characteristics, which could lead to no significant changes in analysts following and no changes in liquidity.

To better distinguish between the *information production hypothesis* and *firm characteristics hypothesis*, I examine and compare liquidity changes of a group of paired bidders. These paired bidders compete to acquire the same target firm. One completes the takeover successfully and the other withdraws its takeover attempt. Since these paired bidders compete for the same target firm, they are likely to get the similar amount of public attention and press coverage, and most likely they produce a similar amount of information during the takeover process. However, because there is only one winner of the paired bidders, in the end only the successful bidder incurs changes in firm characteristics. Given these characteristics, to compare liquidity changes between these paired bidders could distinguish between the *information production hypotheses* and *firm characteristics hypothesis*. That is, if the information produced during the takeover process does not drive the liquidity changes, then only the successful bidders of the paired bidders experience liquidity changes; otherwise, the unsuccessful bidders will also incur liquidity changes.

I obtain 27 paired bidders that compete to acquire the same target firm and compare their changes in liquidity-relative and absolute quoted spreads, quoted depth and relative and absolute

effective spreads. 26 of the 27 paired bidders compete to acquire the same public target and 1 of the 27 paired bidders competes for the same private target.

2.5 Empirical Results

2.5.1 Changes in the Rate of Information Arrival

Table 2 presents the changes in the information arrival rate of bidders prior to and after the announcement date and effective/withdrawal date of the takeovers.

Panel A of Table 2 presents the changes in the standard deviation of market model residuals for the successful and unsuccessful samples. The median standard deviation of market model residuals for the successful takeover group is 3.1 percent before the takeover and increases to 3.3 percent after the takeover. This 20 basis-point (bp) increase is significant at the 0.01 level. The median standard deviation of market model residuals for the unsuccessful takeover group also increases significantly from 3.8 percent to 4.2 percent.

Panel B to Panel E presents the changes in the standard deviation of market model residuals for various sub-samples within the successful or unsuccessful sample. On average, each sub-sample incurs a significant increase in the standard deviation of market model residuals after the completion or withdrawal of the takeovers. For example, Panel C shows that the median standard deviation of market model residuals increases 20 bps for both the related and unrelated successful bidders and Panel E shows that it increases 30 bps for both the related and unrelated unsuccessful bidders.

The increase in volatility suggests that more information (public or private) about the bidder flows into the market, and the bidder's stock price becomes more informative after the acquisitions. Habib, Johnsen and Naik (1997) argue that a more informative price makes

Table 2. Changes in Standard Deviation of Market Model Residuals

This table reports the standard deviation of market model residual of the bidders. The market model applied is:

$$r_{it}^{pre} = \alpha_i^{pre} + \beta_i^{pre} r_{mt}^{pre} + \varepsilon_{it}^{pre}$$
$$r_{it}^{post} = \alpha_i^{post} + \beta_i^{post} r_{mt}^{post} + \varepsilon_{it}^{post}$$

where r_{it} is the daily stock return for a bidder and r_{mt} is the CRSP value-weighted index.
I calculate the standard deviation of market model residual for each bidder prior to and after the announcement date and effective/withdrawal date of the takeover and report the medians of each group. I match each firm's standard deviation of market model residual prior to and after the takeover and calculate its difference. The cell value I report in *difference* is the median of the paired difference in standard deviation of market model residual for each group.

Panel A. Full sample - Successful takeovers compared to unsuccessful takeovers			
	Success	Unsuccess	Difference
Pre-announcement Days (-300,-50)	0.031	0.038	
Post-takeover Days (50,300)	0.033	0.042	
Difference	0.002***	0.003***	-0.001*
Panel B. Successful takeovers – public compared to private			
	Public	Private	Difference
Pre-announcement Days (-300,-50)	0.029	0.036	
Post-takeover Days (50,300)	0.031	0.037	
Difference	0.002***	0.002***	0.000
Panel C. Successful takeovers – related compared to unrelated			
	Related	Unrelated	Difference
Pre-announcement Days (-300,-50)	0.031	0.031	
Post-takeover Days (50,300)	0.033	0.033	
Difference	0.002***	0.002***	0.000
Panel D. Unsuccessful takeovers – public compared to private			
	Public	Private	Difference
Pre-announcement Days (-300,-50)	0.032	0.047	
Post-takeover Days (50,300)	0.038	0.054	
Difference	0.004***	0.003***	0.001
Panel E. Unsuccessful takeovers – related compared to unrelated			
	Related	Unrelated	Difference
Pre-announcement Days (-300,-50)	0.034	0.042	
Post-takeover Days (50,300)	0.039	0.047	
Difference	0.003***	0.003***	0.000

* significant at the 0.1 level; ** significant at the 0.05 level; *** significant at the 0.01 level

uninformed investors better off, attracts more uninformed investors and leads to a decrease in transaction costs and price impact.

2.5.2 Microstructure Elements Analysis

2.5.2-1 Liquidity Changes for Successful Bidders and Unsuccessful Bidders

Table 3 reports and compares the changes in relative spreads, absolute spreads and depth for successful and unsuccessful bidders. Panel A presents and compares changes in relative spreads, which include time-weighted quoted relative spreads (quoted relative spreads) and relative effective spreads. Panel B presents and compares changes in absolute spreads, which include time-weighted quoted absolute spreads (quoted absolute spreads), absolute effective spreads and time-weighted quoted depth (quoted depth). Since the data are highly skewed, I report medians in Table 3. Particularly, the level reported (i.e. the number reported in each event window) is the median value and the change reported (i.e. the number reported in change) is the median value of pair-differences.

I focus the analysis on changes in relative spreads because they capture the economic significance of spread to dealers and investors. In fact, absolute spreads do not have much meaning if we do not consider the relevant price levels. Overall, the evidence in Table 3 indicates that liquidity measured as relative spreads improves for successful bidders, but stays stable op decreases for unsuccessful bidders.

Panel A of Table 3 presents and compares changes in relative spreads, which include relative quoted spread and relative effective spread, for successful and unsuccessful bidders. The relative quoted spread for successful bidders is 1.354 percent before the takeover. It decreases significantly to 1.258 percent and to 1.288 percent in the [+1, +2] and [+1, +4] intervals after the takeover. This decrease persists over the subsequent eighty trading days. In the [+61, +80]

Table 3: Liquidity Changes for Successful and Unsuccessful Bidders

This table shows changes in liquidity for both the successful and unsuccessful bidders. Panel A shows the changes in the time-weighted relative quoted spreads and the relative effective spreads. Panel B shows the changes in the time-weighted absolute quoted spreads, the absolute effective spreads and the time-weighted quoted depth. The absolute quoted spread is the difference between the ask price and the bid price of a quote. The absolute effective spread is twice the absolute value of the difference between the trade price and the prevailing quote midpoint. The depth is the average of ask and bid size for a quote. The relative quoted spread is the absolute quoted spread divided by the quoted midpoint. The relative effective spread is the absolute effective spread divided by the prevailing quote midpoint. The time-weighted absolute quoted spread (relative quoted spread, depth) is the absolute quoted spread (relative quoted spread, depth) weighted by the length of time over which each quote is valid. The numbers reported are medians.

	Panel A: Changes in Relative Spreads (%)					
	Relative Quoted Spreads			Relative Effective Spreads		
	Success	Unsuccess	Difference	Success	Unsuccess	Difference
Days (-80,-21)	1.354	1.533		1.012	1.240	
Days (+1, +2)	1.258	1.672		0.906	0.900	
Change	-0.087***	0.001**	-0.088***	-0.063***	0.008**	-0.071***
Days (+1,+4)	1.288	1.611		0.904	0.891	
Change	-0.075***	0.002***	-0.077***	-0.060***	0.018***	-0.078***
Days (+1, +20)	1.280	1.764		0.922	0.920	
Change	-0.075***	0.021***	-0.096***	-0.060***	0.021***	-0.081***
Days(+21, +40)	1.265	1.707		0.918	0.937	
Change	-0.082***	0.037***	0.119***	-0.061***	0.020***	-0.081***
Days(+41, +60)	1.287	1.730		0.912	0.912	
Change	-0.083***	0.013***	-0.096***	-0.062***	0.014***	-0.076***
Days(+61, +80)	1.228	1.652		0.908	0.856	
Change	-0.088***	-0.000	-0.088***	-0.067***	-0.000	-0.067***

(Table 3 cont.)

Panel B: Changes in Absolute Spreads and Depth									
	Quoted Spreads			Effective Spreads			Depth		
	Success	Unsuccess	Difference	Success	Unsuccess	Difference	Success	Unsuccess	Difference
Days (-80,-21)	0.213	0.179		0.074	0.062		22.5	23.0	
Days (+1, +2)	0.202	0.150		0.070	0.055		20.9	25.6	
Change	-0.012***	-0.024***	-0.012***	-0.005***	-0.007***	0.002***	-0.245***	0.218**	-0.463***
Days (+1,+4)	0.202	0.151		0.070	0.054		21.6	26.0	
Change	-0.016***	-0.023***	0.007	-0.004***	-0.007***	0.003***	-0.214***	0.059**	-0.155***
Days (+1, +20)	0.201	0.151		0.071	0.053		22.5	26.9	
Change	-0.009***	-0.020***	0.011***	-0.003***	-0.006***	0.003***	-0.010	0.571***	-0.581***
Days(+21, +40)	0.199	0.152		0.071	0.054		22.32	25.68	
Change	-0.012***	-0.030***	-0.018***	-0.004***	-0.007***	0.003***	-0.198***	0.713***	-0.911***
Days(+41, +60)	0.194	0.146		0.068	0.053		22.42	27.54	
Change	-0.016***	-0.027***	0.011***	-0.005***	-0.008***	0.003***	-0.181	0.149**	-0.33***
Days(+61, +80)	0.193	0.147		0.068	0.051		22.19	26.33	
Change	-0.0186***	-0.030***	0.011***	-0.006	-0.009***	0.003***	-0.127**	0.347*	-0.474***

*significant at the 0.1 level; ** significant at the 0.05 level; *** significant at the 0.01 level

interval, the relative quoted spread decreases to 1.228 percent. In contrast, the relative quoted spread for unsuccessful bidders increases and then stays stable after the withdrawal of the takeover. The relative quoted spread is 1.533 percent before the takeover. It changes significantly to 1.672 percent in the [+1, +2] interval and to 1.611 percent in the [+1, +4] interval. In the first and second 20 trading days after the takeover withdrawal, the relative quoted spread increases to 1.764 percent and 1.707 percent, and both changes are significant at the 0.01 level. However, in the fourth 20 trading days' interval, the relative quoted spread is not significantly different from its pre-takeover counterpart. Furthermore, Column 4 of Panel A indicates that the increase in liquidity measured as the relative quoted spread is greater for successful bidders than for unsuccessful bidders at the 0.01 level for all intervals.

Panel A of Table 3 also shows that after the takeovers, the relative effective spread decreases significantly for successful bidders but stays stable or increases significantly for unsuccessful bidders. The relative effective spread of successful bidders decreases from 1.012 percent to 0.906 percent immediately after the takeover. This decrease persists in the 80 trading days after the takeover, and in the [+61, +80] interval it decreases to 0.908 percent, significantly smaller than its pre-takeover counterpart. In contrast, for unsuccessful bidders, the relative effective spread does not decrease significantly after the takeover. Before the takeover, the relative effective spread is 1.240 percent. In the first and second 20 trading days after the takeover withdrawal, the relative effective spread increases 0.021 percent and 0.020 percent respectively, and both changes are significant at the 0.01 level. In the fourth 20 trading days, it returns to its pre-takeover level. Furthermore, Column 7 of Panel A indicates that the increase in liquidity measured as the relative effective spread is greater for successful bidders than for unsuccessful bidders at the 0.01 level for all intervals.

For completeness, I also examine changes in absolute spreads and depth. I report the results in Panel B. As explained, because of the influence of size or price level, these measures do not provide good estimates of changes in liquidity.

Liquidity improves for successful bidders after the takeovers. However, this finding could be driven by the information generated during the takeover process, or the changes in firm characteristics - the effect of bundling claims together or the increases in firm size. We cannot distinguish between these two hypotheses based on an analysis of successful bidders only. Thus, I also examine unsuccessful takeovers but find that liquidity does not improve for unsuccessful bidders after they withdraw their offers. Both successful bidders and unsuccessful bidders produce public information during the acquisition process, but unsuccessful bidders do not bundle claims together or increase in firm size. Hence, this evidence suggests that information generated during the takeover process does not have a persistent influence on the bidders' liquidity. Liquidity improves for successful bidders because of changes in firm characteristics: the effect of claim bundling or increase in firm size.

My sample includes the takeovers or the attempted takeovers announced between April 1, 1995 and Dec.31, 2001. During this period, NYSE reduced the minimum price variation (tick) from an eighth to a sixteenth and later from a sixteenth to a penny. Specifically, on June 24, 1997, the New York Stock Exchange (NYSE) reduced the tick size for quoting and trading stocks from an eighth to a sixteenth, and beginning on January 29, 2001, the New York Stock Exchange started quoting and trading all its listed issues in increments of a penny rather than in increments of a sixteenth of a dollar. These reductions in the tick size could possibly drive my findings. To examine this possibility, I exclude the takeovers or the attempted takeovers that announced

Table 4. Liquidity Changes for Successful and Unsuccessful Bidders after Excluding Takeovers Announced before June 24, 1997 (January 29, 2001) and Completed or Withdrawn after June 24, 1997 (January 29, 2001)

This table shows changes in liquidity for both the successful and unsuccessful bidders announced before June 24, 1997 (January 29, 2001) and completed or withdrawn after June 24, 1997 (January 29, 2001). It shows the changes in the time-weighted relative quoted spreads and the relative effective spreads. The absolute quoted spread is the difference between the ask price and the bid price of a quote. The absolute effective spread is twice the absolute value of the difference between the trade price and the prevailing quote midpoint. The depth is the average of ask and bid size for a quote. The relative quoted spread is the absolute quoted spread divided by the quoted midpoint. The relative effective spread is the absolute effective spread divided by the prevailing quote midpoint. The time-weighted absolute quoted spread (relative quoted spread, depth) is the absolute quoted spread (relative quoted spread, depth) weighted by the length of time over which each quote is valid. The numbers reported are medians.

	Relative Quoted Spreads			Relative Effective Spreads		
	Successful	Unsuccessful	Difference	Successful	Unsuccessful	Difference
Days (-80,-21)	1.361	1.514		1.01	1.194	
Days (+1, +2)	1.267	1.682		0.910	1.226	
Change	-0.08***	0.002***	-0.082***	-0.062***	0.015***	-0.077***
Days (+1,+4)	1.300	1.607		0.927	1.227	
Change	-0.07***	0.013***	-0.083***	-0.054***	0.019***	-0.073***
Days (+1, +20)	1.288	1.765		0.926	1.250	
Change	-0.07***	0.034***	-0.104***	-0.054***	0.019***	-0.073***
Days(+21, +40)	1.287	1.693		0.940	1.271	
Change	-0.074***	0.053***	-0.127***	-0.057***	0.022***	-0.079***
Days(+41, +60)	1.307	1.745		0.943	1.235	
Change	-0.08***	0.028***	-0.108***	-0.054***	0.018***	-0.072***
Days(+61, +80)	1.259	1.653		0.929	1.221	
Change	-0.081***	0.016**	-0.097***	-0.061***	0.008**	-0.069***

* significant at the 0.1 level; ** significant at the 0.05 level; *** significant at the 0.01 level

Table 5. Liquidity Changes after Controlling for Index

This table presents the changes in time-weighted quoted spreads, time-weighted relative quoted spreads and time-weighted depth of successful and unsuccessful takeovers before and after the takeover announcement date and effective/withdrawal date respectively, after controlling for the S&P 500 index. The pre-event window is from 80 to 21 days before the takeover announcement date. Numbers reported are the median paired differences from the pre-event level, after adjusting for the changes in the S&P 500 index

	Relative Quoted Spreads			Quoted Spreads			Depth		
Changes	Success	Unsuccess	Difference	Success	Unsuccess	Difference	Success	Unsuccess	Difference
Days (+1, +2)	-0.082***	-0.006***	-0.076***	-0.016***	-0.031***	0.015***	2.89***	11.20***	-8.31
Days (+1,+4)	-0.081***	0.003***	-0.084***	-0.015***	-0.031***	0.016***	6.09***	17.65***	-11.56***
Days (+1, +20)	-0.072***	0.019***	-0.091***	-0.014***	-0.032***	0.018***	10.52***	14.08***	-3.56
Days(+21, +40)	-0.071***	0.044***	-0.115***	-0.020***	-0.035***	0.015***	18.87	29.73	-10.86*
Days(+41, +60)	-0.080***	0.020**	-0.100***	-0.023***	-0.040***	0.017***	20.16***	29.45***	9.29**
Days(+61, +80)	-0.088***	-0.006***	-0.082***	-0.027***	-0.040***	0.013***	23.28***	34.68***	11.4*

*significant at the 0.1 level; ** significant at 0.05 level; *** significant at the 0.01 level

before June 24, 1997 (January 29, 2001) and completed or withdrawn after June 24, 1997 (January 29, 2001). The results are statistically and qualitatively similar. Results are reported in Table 4.

As an additional check against the systematic liquidity effects of tick-size change, I use the S&P500 index fund as a proxy for market and examine the quoted liquidity changes (relative quoted spread in particular) after controlling for the market liquidity. The results, presented in Table 5, are statistically and qualitatively similar to the results in Table 3

Table 5 shows that the relative quoted spread decreases significantly for successful bidders in all event windows after the takeover. For example, it decreases 0.082 percent in the first two days after the takeover and decreases 0.088 percent for the 61 to 80 days after the takeover. In contrast, the relative quoted spread does not show a consistent and significant decrease for unsuccessful bidders. In the first two days after the takeover, the unsuccessful bidders have a 0.006 percent decrease in its relative quoted spread. However, in the [+1, +20], [+21, +40], and [+41, +60] intervals, the relative quoted spread increases 0.019 percent, 0.044 percent and 0.020 percent for unsuccessful bidders respectively. This evidence suggests that the liquidity improvement for successful bidders is not driven by the changes in tick size.

2.5.2-2 Comparison of Liquidity Changes for Public and Private Acquisitions and Related and Unrelated Acquisitions

In this section, I compare liquidity changes between bidders that acquire public firms to bidders that acquire private firms. I also compare liquidity changes between bidders that make related acquisitions to those that make unrelated acquisitions. Because investors are likely to be better informed about public firms than private firms, informed investors will lose more of their information advantage when the bidder acquires a private firm than when the bidder acquires a public firm. Hence, to compare the liquidity changes of bidders that acquire public and private

firms tests the bundling claims hypothesis. Furthermore, the volume of acquisitions involving privately held companies has already reached a level that exceeds the takeover volume for public-traded firms (Ang and Kohers, 2001), therefore, to include acquisitions of privately held companies in the study provides a better understanding of how acquisitions influence bidders' liquidity. Panel A of Table 6 presents and compares the liquidity changes for bidders that acquire public and private firms.

Panel A of Table 6 shows that bidders that acquire private firms have similar improvements in liquidity as bidders that acquire public firms. Consider the changes in quoted relative spreads in the [+1, +20] interval for example. The quoted relative spread decreases 0.085 percent for bidders that acquire public firms, which is not significantly different from the decrease of 0.083 percent for bidders that acquire private firms.

Panel B of Table 6 reports and compares the liquidity changes for bidders that make related and unrelated takeovers. Bidders that make related and unrelated takeovers both enjoy liquidity improvements, but there is no persistent and significant difference between these two sub-samples. For example, in the [+21, +40] after the effective date of the takeover, the relative effective spread decreases 0.084 and 0.075 percent for related and unrelated takeovers respectively, but the difference between these decreases is not significantly different from zero. However, this result could be driven by the method I use to define related and unrelated acquisitions. Furthermore, investors are likely to be poorly (well) informed about all private (public) firms, which reduces the power of this test.

In Table 6, I classify related and unrelated takeovers based on the first 2-digit SIC code of the bidder and the target. This classification is based on the assumption that firms in similar industries are related to each other. However, it is also possible that some firms, which are not in

Table 6. Liquidity Changes for Subsamples of Successful Bidders

This table shows the changes in liquidity for the subsamples of the successful bidders. Panel A shows and compares the liquidity changes for the successful bidders of the public and private takeovers. Panel B shows and compares the liquidity changes for the successful bidders of related and unrelated takeovers. The absolute quoted spread is the difference between the ask price and the bid price of a quote. The absolute effective spread is twice the absolute value of the difference between the trade price and the prevailing quote midpoint. The depth is the average of ask and bid size for a quote. The relative quoted spread is the absolute quoted spread divided by the quoted midpoint. The relative effective spread is the absolute effective spread divided by the prevailing quote midpoint. The time-weighted absolute quoted spread (relative quoted spread, depth) is the absolute quoted spread (relative quoted spread, depth) weighted by the length of time over which each quote is valid. The numbers reported are medians.

Panel A: Public compared to private takeovers						
	Relative Quoted Spreads (%)			Relative Effective Spreads (%)		
	Public	Private	Difference	Public	Private	Difference
Days (-80,-21)	0.815	1.924		0.570	1.444	
Days (+1, +2)	0.668	1.712		0.470	1.258	
Change	-0.093***	-0.087***	-0.006	-0.046***	-0.078***	0.032
Days (+1,+4)	0.666	1.724		0.479	1.271	
Change	-0.087***	-0.075	-0.012	-0.047***	-0.073***	0.026
Days (+1, +20)	0.650	1.741		0.480	1.280	
Change	-0.085***	-0.083***	-0.002	-0.050***	-0.075***	0.025
Days(+21, +40)	0.669	1.77		0.484	1.288	
Change	-0.074***	-0.086***	0.012	-0.047***	-0.080***	0.033
Days(+41, +60)	0.682	1.794		0.508	1.340	
Change	-0.084***	-0.092***	0.008	-0.059***	-0.077***	0.018
Days(+61, +80)	0.685	1.726		0.510	1.293	
Change	-0.082***	-0.082***	0.000	-0.060***	-0.080***	0.020

(Table 6 cont.)

	Quoted Spreads			Effective Spreads			Depth		
	Public	Private	Difference	Public	Private	Difference	Public	Private	Difference
Days (-80,-21)	0.188	0.240		0.062	0.087		32.33	20	
Days (+1, +2)	0.165	0.231		0.056	0.085		33.23	20	
Change	-0.020***	-0.006*	-0.014***	-0.006***	-0.004***	-0.002***	0.833***	-0.740***	1.573***
Days (+1,+4)	0.167	0.236		0.057	0.085		31.05	20	
Change	-0.022***	-0.005	-0.017***	-0.006***	-0.002**	-0.004***	0.099**	-0.636***	0.735***
Days (+1, +20)	0.169	0.228		0.057	0.084		33.19	20	
Change	-0.017***	-0.005**	-0.012***	-0.004***	-0.002***	-0.002***	0.793***	-0.189***	0.982***
Days(+21, +40)	0.166	0.226		0.056	0.084		33.76	20	
Change	-0.019***	-0.007***	-0.012***	-0.006***	-0.004***	-0.002***	0.358***	-0.404***	0.762***
Days(+41, +60)	0.159	0.219		0.055	0.081		33.71	20	
Change	-0.025***	-0.012***	-0.013***	-0.008***	-0.005***	-0.003***	0.115*	-0.204**	0.319***
Days(+61, +80)	0.162	0.216		0.053	0.081		32.30	20	
Change	-0.027***	-0.013***	-0.014***	-0.009***	-0.006***	-0.003***	0.071	-0.186	0.257*

(Table 6 cont.)

Panel B: Related compared to unrelated takeovers						
	Relative Quoted Spreads (%)			Relative Effective Spreads (%)		
	Related	Unrelated	Difference	Related	Unrelated	Difference
Days (-80,-21)	1.308	1.429		0.976	1.057	
Days (+1, +2)	1.213	1.334		0.858	0.982	
Change	-0.092***	-0.073***	-0.019	-0.073***	-0.047***	-0.026**
Days (+1,+4)	1.243	1.344		0.858	1.016	
Change	-0.087***	-0.063***	-0.024	-0.068***	-0.045***	-0.023**
Days (+1, +20)	1.237	1.343		0.881	0.994	
Change	-0.089***	-0.064***	0.025**	-0.067***	-0.051***	-0.016**
Days(+21, +40)	1.228	1.314		0.900	0.997	
Change	-0.084***	-0.075***	-0.009	-0.065***	-0.049***	-0.016
Days(+41, +60)	1.250	1.326		0.893	0.983	
Change	-0.084***	-0.080***	-0.004	-0.060***	-0.064***	0.004
Days(+61, +80)	1.160	1.319		0.854	0.992	
Change	-0.092***	-0.080***	-0.012	-0.060***	-0.070***	0.010

	Quoted Spreads			Effective Spreads			Depth		
	Related	Unrelated	Difference	Related	Unrelated	Difference	Related	Unrelated	Difference
Days (-80,-21)	0.215	0.212		0.076	0.074		22	23.39	
Days (+1, +2)	0.202	0.202		0.069	0.070		20.30	21.52	
Change	-0.014***	-0.007***	-0.007**	-0.006***	-0.003***	-0.003**	-0.203***	-0.740***	0.537
Days (+1,+4)	0.202	0.202		0.070	0.070		20.93	22.34	
Change	-0.013***	-0.009***	-0.004*	-0.005***	-0.004***	-0.001**	-0.157**	-0.428***	0.271
Days (+1, +20)	0.200	0.204		0.071	0.071		21.61	23.61	
Change	-0.011***	-0.005***	-0.006**	-0.004***	-0.002***	-0.002***	0	-0.117	0.117
Days(+21, +40)	0.198	0.202		0.071	0.069		22.26	22.52	
Change	-0.014***	-0.009***	-0.005**	-0.005***	-0.003***	-0.002**	-0.142	-0.393**	0.251
Days(+41, +60)	0.196	0.191		0.069	0.067		22.26	22.52	
Change	-0.018***	-0.014***	-0.004**	-0.006***	-0.004***	-0.002**	-0.142	-0.393**	0.251
Days(+61, +80)	0.193	0.196		0.068	0.067		22.17	22.89	
Change	-0.020***	-0.014**	-0.006***	-0.007***	-0.005***	-0.002**	-0.040	-0.530**	0.49*

* significant at the 0.1 level; ** significant at the 0.05 level; *** significant at the 0.01 level

Table 7. Liquidity Changes between Related and Unrelated Takeovers

This table presents and compares liquidity changes between related and unrelated successful public takeovers. If the correlation of stock returns between the bidder and the target is positive, I classify the takeover as a related takeover. If the correlation of stock returns between the bidder and the target is negative, I classify the takeover as an unrelated takeover. The stock returns I examine are from three hundred days to fifty days before the announcement day of the takeover. The numbers reported are the changes in each measure.

	Changes in relative quoted spread		Changes in relative effective spread	
	mean	median	mean	median
Unrelated	-0.247	-0.117	-0.187	-0.051
Related	-0.107	-0.067	-0.102	-0.047
Difference	-0.140	-0.050	-0.085	-0.004
(p-value)	(0.477)	(0.441)	(0.576)	(0.370)

* significant at the 0.1 level; ** significant at the 0.05 level; *** significant at the 0.01 level

the same/similar industry, could also be related to each other and such relatedness is reflected in the movements of their stock prices' responses to news/information. Therefore, I divide the successful takeovers into related and unrelated based on the bidder's stock return correlation with the target's return. I then compare liquidity changes between these two groups of bidders.

In Table 7, if the bidder's stock return has a positive correlation with the target's stock return, the takeover is classified as related. If the bidder's return and the target's return are negatively correlated, the takeover is classified as unrelated. Table 7 indicates that the changes in liquidity between successful and unsuccessful bidders are not significantly different. This result is similar if I classify takeovers as related or unrelated based on the magnitude rather than the sign of the correlation. Overall, results in Table 7 strengthen the findings that related and unrelated successful bidders have similar liquidity improvements after the takeovers.

2.5.2-3 Comparison of Liquidity Changes for Bidders that Use Different Methods of Payments

Methods of payments could influence liquidity changes of the bidders. On one hand, a bidder that uses stock as a medium of exchange could enjoy more liquidity improvement than a bidder that uses cash as a medium of exchange. Hansen (1987) argues that bidders prefer to use stock as a medium of exchange when they are less certain of the target's value[3]. Based on Hansen, after a stock acquisition, the bidder's informed investor will face a basket of securities that consist of some security he has no information advantage. Compared to informed investors of the bidder in a cash acquisition, informed investors of the bidder in a stock takeover will lose more of their information advantage after the takeover. Therefore, bidders using stock as a medium of exchange will enjoy greater liquidity improvements. Alternatively, Merton (1987) argues that an increase in the investor base improves a firm's liquidity. A bidder that uses stock

[3] An alternative argument is that bidders choose to use stock in acquisitions because they perceive their stocks to be overvalued (Myers and Majluf, 1984)

as the medium of exchange will increase its investor base because some of the shareholders in the acquired firm, who do not own shares in the bidder prior to the acquisition, will hold onto the bidder's shares afterward.

Alternatively, if the target has concentrated ownership before the acquisition, then using stock as the medium of exchange could create a large, and most likely, informed owner of the bidder after the acquisition. In this scenario, bidders that use stock as the medium of exchange could have less improvement in liquidity than bidders that use cash as the medium of exchange.

To examine this issue, I obtain from the successful takeover sample a group of bidders that use either cash or stock as the payment method and examine and compare their liquidity changes.

Panel A of Table 8 displays and compares changes in relative quoted spreads and relative effective spreads for successful stock and cash takeovers. Bidders that use stock as the method of payment display significantly and consistently greater improvements in liquidity than bidders that use cash as the method of payment. For example, the relative quoted spread of bidders that make stock takeovers decreases 0.130 percent in the [+1, +20] interval, significantly greater than the decrease of 0.062 percent for the bidders that make cash takeovers.

Chang (1998) examines bidders' returns at the takeover announcement when the bidder makes a private acquisition. He finds that bidders experience a positive abnormal return when they use stock in these private transactions, but have no abnormal return if they use cash. Chang (1998) further argues that bidders that offer stock in a private transaction could create a new informed investor. This new informed investor provides monitoring and hence reduces information asymmetries[4]. In this essay, I examine and compare changes in liquidity for private

[4] This is debatable. A new informed investor could increase or decrease information asymmetry. Chang argues that it will decrease information asymmetry.

Table 8. Liquidity Changes for Successful Takeovers Using Different Methods of Payments

This table shows the changes in liquidity for the subsamples of the successful bidders that use either stock or cash as a method of payment. Cash takeover refers to the takeover that uses only cash as the method of payment while stock takeover refers to the takeover that uses only stock as the method of payment. Panel A shows and compares the liquidity changes for the cash and stock takeovers of the full sample. Panel B shows and compares the liquidity changes for the cash and stock takeovers of the private takeover sample. The relative quoted spread is the absolute quoted spread divided by the quoted midpoint, while the absolute quoted spread is the difference between the ask price and the bid price of a quote. The relative effective spread is the absolute effective spread divided by the prevailing quote midpoint, while the absolute effective spread is twice the absolute value of the difference between the trade price and the prevailing quote midpoint.

Panel A: Full Sample-Cash compared to Stock						
	Relative Quoted Spreads (%)			Relative Effective Spreads (%)		
	Cash	Stock	Difference	Cash	Stock	Difference
Days (-80,-21)	1.317	1.168		0.957	0.938	
Days (+1, +2)	1.280	0.907		0.874	0.714	
Change	-0.053***	-0.140***	0.087***	-0.056***	-0.093***	0.037***
Days (+1,+4)	1.340	0.897		0.895	0.726	
Change	-0.048***	-0.154***	0.106***	-0.037***	-0.100***	0.063***
Days (+1, +20)	1.325	0.952		0.917	0.732	
Change	-0.062***	-0.130***	0.068***	-0.045***	-0.090***	0.045***
Days(+21, +40)	1.272	0.922		0.915	0.715	
Change	-0.064***	-0.129***	0.065***	-0.041***	-0.102***	0.061***
Days(+41, +60)	1.330	0.899		0.919	0.721	
Change	-0.061***	-0.107***	0.046***	-0.041***	-0.096***	0.055***
Days(+61, +80)	1.269	0.941		0.928	0.728	
Change	-0.071***	-0.126***	0.055***	-0.049***	-0.101***	0.052***

(Table 8 cont.)

	Panel B: Private Takeover Sample -Cash compared to Stock					
	Cash	Stock	Difference	Cash	Stock	Difference
Days (-80,-21)	1.825	1.642		1.343	1.319	
Days (+1, +2)	1.722	1.376		1.166	1.118	
Change	-0.063	-0.214***	0.151***	-0.054	-0.191***	0.137***
Days (+1,+4)	1.700	1.417		1.271	1.130	
Change	-0.057	-0.278***	0.221***	-0.036	-0.182***	0.146***
Days (+1, +20)	1.726	1.364		1.223	1.094	
Change	-0.065**	-0.200***	0.135***	-0.047*	-0.165***	0.118***
Days(+21, +40)	1.738	1.260		1.210	1.022	
Change	-0.058	-0.159***	0.101***	-0.033	-0.183***	0.150***
Days(+41, +60)	1.830	1.447		1.340	1.105	
Change	-0.065*	-0.180***	0.115***	-0.038*	-0.151***	0.113**
Days(+61, +80)	1.666	1.584		1.222	1.139	
Change	-0.064**	-0.186***	0.122***	-0.058**	-0.187***	0.129**

* significant at the 0.1 level; ** significant at the 0.05 level; *** significant at the 0.01 level

takeovers that use different methods of payments. Panel B of Table 8 shows the result. Panel B shows that bidders that make private stock takeover have significantly more improvements in liquidity than bidders that make private cash takeovers. For example, bidders that make private stock takeovers have a 0.186 percent decrease in relative quoted spread in the [61, 80] interval, while bidders that make private cash takeovers only have 0.064 percent decrease.

Merton (1987) argues that the investor base of a firm influences the firm's liquidity. It is reasonable to argue that a private stock takeover enlarges the bidder's investor base to a greater extent than a private cash takeover. Since the investor base improves a firm's liquidity, a bidder that makes a private stock takeover will enjoy more improvements in liquidity than a bidder that makes a private cash takeover. The evidence documented in Panel B of Table 8 supports Merton's (1987) argument.

2.5.2-4 Comparison of Liquidity Changes for Public and Private, Related and Unrelated Unsuccessful Bidders

Panel A of Table 9 shows and compares liquidity changes for unsuccessful bidders that make public and private takeover attempts. Panel B shows and compares liquidity changes for unsuccessful bidders that make related and unrelated takeover attempts. In each subsample, the bidders' liquidity gets worse and then stays stable after their takeover attempts fail. Furthermore, Table 9 does not show any persistent and significant difference between the liquidity changes of paired sub-samples. This result implies that the information generated during the takeover process does not have a significant influence on unsuccessful bidders, related or unrelated, private or public. It also implies that the combination, increase in firm size and other changes in firm characteristics are important.

Take the unsuccessful bidders that make private takeover attempts for example. Panel A of Table 9 shows that for the first 40 days after they withdrawn their takeover attempts, this group

Table 9. Liquidity Changes for Subsamples of Unsuccessful Bidders

This table shows the changes in liquidity for the subsamples of the unsuccessful bidders. Panel A shows and compares the liquidity changes for the unsuccessful bidders of the public and private takeovers. Panel B shows and compares the liquidity changes for the unsuccessful bidders of related and unrelated takeovers. The absolute quoted spread is the difference between the ask price and the bid price of a quote. The absolute effective spread is twice the absolute value of the difference between the trade price and the prevailing quote midpoint. The depth is the average of ask and bid size for a quote. The relative quoted spread is the absolute quoted spread divided by the quoted midpoint. The relative effective spread is the absolute effective spread divided by the prevailing quote midpoint. The time-weighted absolute quoted spread (relative quoted spread, depth) is the absolute quoted spread (relative quoted spread, depth) weighted by the length of time over which each quote is valid. The numbers reported are medians.

Panel A: Public compared to private takeovers						
	Relative Quoted Spreads (%)			Relative Effective Spreads (%)		
	Public	Private	Difference	Public	Private	Difference
Days (-80,-21)	0.997	3.270		1.125	1.194	
Days (+1, +2)	0.939	3.758		1.196	1.100	
Change	-0.037	0.204***	-0.241***	0.026*	-0.004	0.030
Days (+1,+4)	0.976	3.920		1.166	1.148	
Change	-0.026	0.215***	-0.241**	0.022	-0.003	0.025
Days (+1, +20)	1.064	3.856		1.171	1.220	
Change	-0.016	0.241***	-0.257***	0.051**	-0.011*	0.062
Days(+21, +40)	1.074	3.505		1.274	1.169	
Change	0.006	0.002***	0.004*	0.032**	0.010**	0.022
Days(+41, +60)	1.009	3.829		1.167	1.145	
Change	-0.004	0.159	-0.163	0.019*	-0.003	0.022
Days(+61, +80)	1.026	3.812		1.222	1.074	
Change	-0.004	0.122	0.126	0.005	-0.020	0.025

(Table 9 cont.)

	Quoted Spreads			Effective Spreads			Depth		
	Public	Private	Difference	Public	Private	Difference	Public	Private	Difference
Days (-80,-21)	0.174	0.201		0.061	0.063		28.10	19.90	
Days (+1, +2)	0.144	0.162		0.056	0.056		33.72	20	
Change	-0.018***	-0.028***	-0.010	-0.009***	-0.011***	0.002	0.634**	0.096*	0.538
Days (+1,+4)	0.147	0.168		0.052	0.056		35.65	20	
Change	-0.020***	-0.027***	0.007	-0.008***	-0.009***	0.001	0.145**	0.014	0.131
Days (+1, +20)	0.148	0.158		0.055	0.053		33.61	20	
Change	-0.017***	-0.025***	0.008	-0.008***	-0.008***	0.000	0.930**	0.522***	0.408
Days(+21, +40)	0.148	0.167		0.055	0.056		33.20	20	
Change	-0.020***	-0.032***	0.012	-0.012***	-0.009***	-0.003	1.297	0.391***	0.906
Days(+41, +60)	0.143	0.165		0.056	0.056		32.85	20.59	
Change	-0.024***	-0.028***	0.004	-0.012***	-0.010***	-0.002	0.144	0.688**	-0.544
Days(+61, +80)	0.137	0.169		0.054	0.053		33.16	20	
Change	-0.025***	-0.036***	0.011	-0.012***	-0.011	-0.001	0.316	0.536**	-0.22

Panel B: Related compared to unrelated takeovers

	Relative Quoted Spreads (%)			Relative Effective Spreads (%)		
	Related	Unrelated	Difference	Related	Unrelated	Difference
Days (-80,-21)	1.346	2.014		1.156	1.369	
Days (+1, +2)	1.292	2.285		1.227	1.113	
Change	-0.029	0.053***	-0.082**	0.030***	-0.028	0.058***
Days (+1,+4)	1.308	2.309		1.240	1.206	
Change	-0.003	0.041***	-0.044	0.033***	-0.021	0.054**
Days (+1, +20)	1.453	2.211		1.238	1.355	
Change	0.019***	0.044***	-0.025	0.035***	-0.009	0.044
Days(+21, +40)	1.400	2.241		1.274	1.271	
Change	0.037***	0.052***	-0.015	0.034***	-0.023	0.057**
Days(+41, +60)	1.315	2.038		1.146	1.394	
Change	0.015*	0.012	0.003	0.027***	-0.021	0.048
Days(+61, +80)	1.398	2.217		1.133	1.407	
Change	0.018*	-0.056	0.074	0.017*	-0.032	0.049

(Table 9 cont.)

	Quoted Spreads			Effective Spreads			Depth		
	Related	Unrelated	Difference	Related	Unrelated	Difference	Related	Unrelated	Difference
Days (-80,-21)	0.183	0.175		0.063	0.060		23.33	22.25	
Days (+1, +2)	0.149	0.151		0.059	0.052		25.91	24.37	
Change	-0.027***	-0.020***	-0.007	-0.007***	-0.011***	0.004**	0.159**	0.304	-0.145
Days (+1,+4)	0.149	0.154		0.057	0.054		26.18	25.46	
Change	-0.027***	-0.018***	-0.009	-0.007***	-0.009***	0.002	0.046*	0.202*	-0.156
Days (+1, +20)	0.150	0.155		0.055	0.053		26.02	28.05	
Change	-0.022***	-0.017***	-0.005	-0.007***	-0.007***	0.000	0.161**	0.926**	-0.765
Days(+21, +40)	0.151	0.155		0.056	0.055		26.66	24.94	
Change	-0.026***	-0.021***	-0.005	-0.007***	-0.010***	0.003	0.556**	1.124**	-0.568
Days(+41, +60)	0.147	0.145		0.056	0.054		28.17	25.97	
Change	-0.031***	-0.021***	-0.010	-0.008***	-0.011***	0.003	0.095*	0.816	-0.721
Days(+61, +80)	0.150	0.144		0.054	0.052		26.00	27.31	
Change	-0.033***	-0.026***	-0.007	-0.010***	-0.012***	0.002	0.114	0.905*	-0.791

* significant at the 0.1 level; ** significant at the 0.05 level; *** significant at the 0.01 level

of bidders have significant increases in relative quoted spreads. For the 41 to 80 days after they withdraw their takeovers, the relative quoted spread does not have significant differences from its pre-takeover level.

2.5.3 Information Asymmetry Changes

Thus far, my results show that liquidity measured as the quoted relative spread and the relative effective spread improves for successful bidders but stays stable/decreases for unsuccessful bidders. In this section I analyze the changes in information asymmetry for successful and unsuccessful bidders. The analyses focus on the changes in the price impact and changes in the probability of information based trading of the bidders.

2.5.3-1 Price Impact

Panel A of Table 10 displays and compares the changes in price impact for the successful and unsuccessful bidders. For successful bidders, the 5-quote measure of price impact is 58bp before the takeover, and it decreases significantly to 48bp (49bp) in the first two (four) days after the takeover. The decrease in price impact for successful bidders persists. Their 5-quote measure price impact is 53.8bp, 53.1bp and 54bp in the first, second and third 20-day period after the takeovers, all of which are significantly smaller than their pre-takeover counterparts. In the [+61, +80] interval, the 5-quote measure price impact is 53bp, which is still significantly smaller than its pre-takeover level. For unsuccessful bidders, however, the 5-quote measure of price impact stays stable or even increases significantly after their takeover attempt fails. In summary, Panel A of Table 10 shows that the price impact decreases for successful bidders, but increases/stays stable for unsuccessful bidders and their differences in changes are significantly different from each other.

Table 10. Changes in Price Impact around the Takeovers

This table examines and compares changes in price impacts of the bidders around the takeovers. It focuses on the transaction data of the exchange on which the firm is listed. Price impact is measured by comparing the quoted midpoint immediately prior to a trade to the quoted midpoint after 5 transactions. The value reported is the median of the means in each group.

Panel A. Full sample - Successful takeovers compared to unsuccessful takeovers			
	Success	Unsuccess	Difference
Days (-80,-21)	0.0058	0.0054	
Days (+1, +2)	0.0048	0.0051	
Change	-0.00038***	0.00001**	-0.00039***
Days (+1,+4)	0.0049	0.0056	
Change	-0.00038***	0.000042***	-0.00042***
Days (+1, +20)	0.00538	0.0061	
Change	-0.0003***	0.0001***	-0.0004***
Days(+21, +40)	0.00531	0.0063	
Change	-0.0003***	0.00006***	-0.00036***
Days(+41, +60)	0.0054	0.0063	
Change	-0.0003***	0.00014***	-0.00044***
Days(+61, +80)	0.0053	0.0062	
Change	-0.0004***	0.00014	-0.00054***
Panel B. Successful takeovers – public compared to private			
	Public	Private	Difference
Days (-80,-21)	0.0037	0.0069	
Days (+1, +2)	0.0030	0.0059	
Change	-0.00036***	-0.00049***	0.00013***
Days (+1,+4)	0.0031	0.0065	
Change	-0.00038***	-0.00049***	0.00011***
Days (+1, +20)	0.0032	0.0065	
Change	-0.00037***	-0.00032***	-0.00005***
Days(+21, +40)	0.0032	0.0068	
Change	-0.00035***	-0.00032***	-0.00003***
Days(+41, +60)	0.0030	0.0067	
Change	-0.00041***	-0.00032	-0.00009***
Days(+61, +80)	0.0032	0.0068	
Change	-0.00044***	-0.00029*	-0.00015***

(Table 10 cont.)

	Panel C. Successful takeovers – related compared to unrelated		
	Related	Unrelated	Difference
Days (-80,-21)	0.00513	0.0059	
Days (+1, +2)	0.00446	0.0052	
Change	-0.00038***	-0.00035***	-0.00003***
Days (+1,+4)	0.0047	0.0054	
Change	-0.00036***	-0.00042***	0.00006***
Days (+1, +20)	0.0050	0.0060	
Change	-0.00034***	-0.00033**	-0.00001***
Days(+21, +40)	0.0050	0.0061	
Change	-0.00032***	-0.00027***	-0.00005***
Days(+41, +60)	0.0051	0.0059	
Change	-0.00030***	-0.00041***	0.00011***
Days(+61, +80)	0.0051	0.0057	
Change	-0.00033***	-0.00036***	0.00003***
	Panel D. Unsuccessful takeovers – public compared to private		
	Public	Private	Difference
Days (-80,-21)	0.0048	0.0054	
Days (+1, +2)	0.0049	0.0048	
Change	0.00006*	-0.00001	0.00007***
Days (+1,+4)	0.0049	0.0054	
Change	-0.00001	0.0001*	-0.00011***
Days (+1, +20)	0.0047	0.0061	
Change	0.00021	0.0001***	0.00011***
Days(+21, +40)	0.0054	0.0062	
Change	0.0002**	0.00004*	0.00016***
Days(+41, +60)	0.0051	0.0060	
Change	0.00019	0.00011*	0.00008***
Days(+61, +80)	0.0049	0.0060	
Change	0.0002	0.0001**	0.0001***
	Panel E. Unsuccessful takeovers – related compared to unrelated		
	Related	Unrelated	Difference
Days (-80,-21)	0.0054	0.0050	
Days (+1, +2)	0.0051	0.0051	
Change	0.000064***	-0.00006	0.000124***
Days (+1,+4)	0.0054	0.0059	
Change	0.00009***	-0.00003	0.00012***
Days (+1, +20)	0.0058	0.0068	
Change	0.000027***	0.0001**	-0.000073***
Days(+21, +40)	0.0060	0.0066	
Change	0.0002***	-0.00013	0.00033***
Days(+41, +60)	0.0059	0.0065	
Change	0.0002***	-0.00004	0.00024***
Days(+61, +80)	0.0062	0.0062	
Change	0.00014**	0.00011**	0.00003***

* significant at the 0.1 level; ** significant at the 0.05 level; *** significant at the 0.01 level

Panel B of Table 10 displays and compares changes in price impact between successful bidders that make public and private acquisitions. Panel C displays and compares changes in price impact between successful bidders that make related and unrelated acquisitions. All the sub-samples enjoy persistent decreases in price impacts. This suggests that all subsamples of the successful bidders have lower information asymmetry after the takeovers. In addition, I also find that successful bidders that acquire a public target have significantly greater reductions in the price impact than successful bidders that acquire a private target. For example, Panel B of Table 10 shows that in the first 20 trading days after the takeover, the price impact decreases 3.7bp and 3.2bp for the bidder of a public firm and of a private firm respectively, and the decreases are significantly different from each other at the 0.01 level. However, from Panel C we cannot observe a persistent and significant difference in the changes of price impacts between related and unrelated takeovers. In addition, I classify the takeovers as related and unrelated based on the stock return correlation between the bidder and the target and examine and compare their changes in price impacts. Consistent with Panel C, I do not find significant differences between related and unrelated successful bidders either.

Panel D displays and compares changes in price impact between unsuccessful bidders that make public and private acquisition attempts. Panel E displays and compares changes in price impact between unsuccessful bidders that make related and unrelated acquisition attempts. These sub-samples either have no significant change or have significant increases in price impact, which implies that their information asymmetry stays stable or increases after they withdraw their takeover attempts. In the second 20 trading days after the takeover withdrawal, the price impact increases significantly from 48bp to 54bp for the unsuccessful bidder of a public target firm, and from 54bp to 61bp for the unsuccessful bidder of a private target firm. In addition,

Panel E also shows that the information asymmetry for the unsuccessful bidders of related and unrelated takeovers stays stable or increases after the takeover attempts fail.

2.5.3-2 Probability of Information-Based Trading

Panel A of Table 11 displays and compares changes in PIN for the successful and unsuccessful bidders. The PIN for successful bidder decreases significantly from 22.26 percent to 21.62 percent after the takeover, but increases insignificantly from 21.02 percent to 21.13 percent for unsuccessful bidders. The difference in change between these two groups is significantly different at the 0.01 level.

Panel B to Panel E display and compare changes in PIN between various sub-samples. On average, they display the same pattern as the full samples. That is, each sub-sample of successful bidders displays a significant decrease in PIN and each sub-sample of unsuccessful bidders shows no significant changes in PIN. Similar to the changes in price impact, successful bidders that acquire a public target experience a significantly larger decrease in PIN than successful bidders that acquire a private target.

In sum, evidences from Table 10 and Table 11 indicate that the information asymmetry measured as the price impact and the PIN decreases for successful bidders, but (depending on the window of analysis) remains the same or even increases for unsuccessful bidders. This suggests that the adverse selection problem associated with the market maker trading against an informed trader decreases significantly for the successful bidders, but not for the unsuccessful bidders. Similar to their successful counterparts, unsuccessful bidders also produce information during the takeover process, but they do no experience changes in firm characteristics, such as bundling claims or increasing in firm size. The finding that the information asymmetry problem only

Table 11. Changes in Probability of Information-Based Trading around the Takeovers

This table examines and compares changes in probability of information-based trading of the bidders around the takeovers. Probability of information-based trading is calculated based on Easley, Hvidkjaer and O'Hara (2002)'s structural model. In the model, at each trading day, there is a probability α of information arrival. This information can be bad news with a probability of δ, and good news with a probability of $1-\delta$. There are three kinds of traders in the market: uninformed buyers, uninformed sellers and informed investors. Orders from uninformed buyers (sellers) arrive at a rate of ε_b (ε_s) and orders from informed investors arrive at a rate of μ, and all of them obey Poisson Distributions. Informed investors sell when there is bad news and buy when there is good news. All α, μ, ε_b and ε_s are estimated via maximizing likelihood function derived from the structural model.

$$L(\theta \mid B,S) = (1-\alpha)e^{-\varepsilon_b}\frac{\varepsilon_b^{\,B}}{B!}e^{-\varepsilon_s}\frac{\varepsilon_s^{\,S}}{S!} + \alpha\delta e^{-\varepsilon_b}\frac{\varepsilon_b^{\,B}}{B!}e^{-(\mu+\varepsilon_s)}\frac{(\mu+\varepsilon_s)^S}{S!} + \alpha(1-\delta)e^{-(\mu+\varepsilon_b)}\frac{(\mu+\varepsilon_b)^B}{B!}e^{-\varepsilon_s)}\frac{\varepsilon_s^{\,S}}{S!}$$

Based on these estimates, PIN (probability of informed trading) is calculated as, $PIN = \frac{\alpha\mu}{\alpha\mu + \varepsilon_s + \varepsilon_b}$.

The value reported in the parentheses is p-value.

Panel A. Full sample - Successful takeovers compared to unsuccessful takeovers			
	Success	Unsuccess	Difference
Pre-announcement Days (-80,-1)	22.26	21.02	
Post-takeover Days (1,80)	21.62	21.13	
Change	-0.85***	0.45	-1.3***
Panel B. Successful takeovers – public compared to private			
	Public	Private	Difference
Pre-announcement Days (-80,-1)	19.66	23.18	
Post-takeover Days (1,80)	17.17	23.99	
Change	-0.013***	-0.0084	-0.0046***
Panel C. Successful takeovers – related (1) compared to unrelated (2)			
	Related	Unrelated	Difference
Pre-announcement Days (-80,-1)	22.38	22.00	
Post-takeover Days (1,80)	21.59	21.71	
Difference	-0.0098***	-0.0058	-0.004***
Panel D. Unsuccessful takeovers – public (1) compared to private (2)			
	Public	Private	Difference
Pre-announcement Days (-80,-1)	19.79	22.17	
Post-takeover Days (1,80)	19.12	24.45	
Difference	-0.11	1.20***	1.31***
Panel E. Unsuccessful takeovers – related (1) compared to unrelated (2)			
	Related	Unrelated	Difference
Pre-announcement Days (-80,-1)	21.29	20.74	
Post-takeover Days (1,80)	20.31	21.35	
Difference	0.283	0.603*	-0.32***

* significant at the 0.1 level; ** significant at the 0.05 level; *** significant at the 0.01 level

decreases for successful bidders supports the *firm characteristics hypothesis* but does not support the *information production hypothesis*.

2.5.4 Tests of Information Production Hypothesis and Firm Characteristics Hypothesis

Table 12 provides the summary statistics of the number of news stories of the successful and unsuccessful bidders. The number of news stories produced during the takeover process is used to measure the information produced during the takeover process.

Successful bidders have an average of 23 news stories produced during the takeover process, and unsuccessful bidders have an average of 46 news stories. The number of news stories produced for unsuccessful bidders is significantly greater than the number of news stories produced for successful bidders during the takeover process. Actually, the unsuccessful bidders have almost twice the number of news stories produced as the successful bidders. Table 12 also shows that the unsuccessful bidders have a median of 10 news stories produced during the takeover process, significantly greater than the median of 6 news stories produced for the successful bidders. The number of news stories is a proxy for the level of public information produced during the takeover process. Therefore, results shown in Table 11 suggest that during the takeover process, the unsuccessful bidders have more public information produced than the successful bidders.

Table 13 examines and compares changes in the number of analysts' following, analysts' forecast accuracy and dispersion of analysts' forecasts between the successful and unsuccessful bidders around the takeovers. Panel A of Table 13 examines and compares these changes between "before the takeover" and "during the takeover process" (from the first announcement date to the effective/withdrawal date of the takeover).

Table 12. Summary Statistics of the Number of News Produced during the Takeover Process

This table examines and compares the number of news during the takeover process between successful and unsuccessful takeovers. The takeover process is defined as the time between the announcement date and effective/withdrawal date of the takeovers. The number of news is defined as the number of news found on the News Wires from the Lexis/Nexis database.

	Success	Unsuccess	Diff
Mean	23	46	-23***
Median	6	10	-4***
Max	3114	2431	/
Min	0	0	/
Standard Deviation	100	161	/

*significant at the 0.1 level; ** significant at the 0.05 level; *** significant at the 0.01 level

Table 13. Changes in Analysts' Following, Forecast Accuracy and Dispersion of Forecasts

This table examines and compares changes in the number of analysts' following, analysts' forecast accuracy, and dispersion of analysts' forecasts, between the successful and unsuccessful bidders around the takeovers. Panel A compares these changes between "before the takeover" and "during the takeover process" (from the first announcement date to the effective/withdrawal date of the takeover". Panel B compares these changes between "before the takeover" and "after the effective/withdrawal date of the takeover". Analysts' coverage is defined as the number of analysts that provide the fiscal year 1 estimate each month. Forecast accuracy is defined as the deviation of fiscal year 1 earnings estimates from the real values divided by the real values. Dispersion of analysts' forecast is defined as the standard deviation of the fiscal year 1 earnings estimate divided by the mean estimate.

Panel A. Changes during the takeover process							
	Success			Unsuccess			Diff in
	Before	During	Change	Before	During	Change	change
Analysts' Coverage	7.19	7.28	0.09	7.77	7.96	0.19*	-0.10
Forecast Accuracy	0.014	0.032	-0.0003	0.047	0.119	-0.00012	-0.00018
Dispersion of Forecasts	0.125	0.129	0.0039	0.191	0.180	-0.011	0.015
Panel B. Changes after the takeover							
	Success			Unsuccess			Diff in
	Before	After	Change	Before	After	Change	change
Analysts' Coverage	6.54	6.91	0.37***	7.67	7.58	-0.09	0.46***
Forecast Accuracy	0.0184	0.024	0.0005***	0.048	0.066	0.0002	0.0003
Dispersion of Forecasts	0.052	0.031	-0.021	0.075	0.053	-0.022	0.001**

* significant at the 0.1 level; ** significant at the 0.05 level; *** significant at the 0.01 level

Panel A of Table 13 shows that the successful bidders have similar number of analysts' following during the takeover process compared to their pre-takeover level, but the unsuccessful bidders have significantly more analysts' following during the takeover process. Since the number of analysts' following is a proxy for the level of public information produced, an increase in the number of analysts' following for the unsuccessful bidders suggests that they have more public information produced during the takeover process.

The information production hypothesis suggests that the public information produced during the takeover process is a driving factor of liquidity improvements for bidders. If this information production hypothesis holds, given that the unsuccessful bidders have more public information produced during the takeover process than the successful bidders, it is reasonable to expect the unsuccessful bidders to exhibit some improvements in liquidity. However, the evidence from my analysis above indicates that the unsuccessful bidders do not have improvements in liquidity at all. Therefore, my results do not support the information production hypothesis.

Panel B of Table 13 compares changes in analysts' following between "before the takeover" to "after the effective/withdrawal date of the takeover". As I discuss above, I classify changes in the analyst coverage after successful acquisitions as changes related to firm characteristics since the change in coverage occurs after the completed acquisition. To examine the relationship between these changes with changes in liquidity sheds light on the firm characteristics hypothesis. Panel B shows that the successful bidders have significant more analysts' following after they complete their takeovers, while the unsuccessful bidders do not have significant increases in analysts' following. Extant literature suggests that more analysts' following of a firm produces more public information for the firm and makes the firm more liquid. Therefore, it is reasonable to expect successful bidders to enjoy liquidity improvements after the takeovers while

unsuccessful bidders not, which is exactly what I find. Therefore, evidences produced in Panel B of Table 13 lend support to the firm characteristics hypothesis.

Table 14 compares liquidity changes of paired bidders that compete to acquire the same target firm. Panel A compares the changes in relative quoted spreads and relative effective spreads. Panel B compares the changes in absolute quoted spreads and depth. As I have discussed in detail in the methods part, these paired bidders are likely to produce a similar amount of information during the takeover process, but in the end only the successful bidder incurs changes in firm characteristics. To compare liquidity changes between them could distinguish between the information production hypotheses and firm characteristics hypothesis. That is, if the information produced during the takeover process does not drive the liquidity changes, then only the successful bidders of the paired bidders experience liquidity changes; otherwise, the unsuccessful bidders will also incur liquidity changes.

Panel A of Table 14 shows that both the successful and unsuccessful bidders of the paired sample have decreases in the relative quoted and effective spreads and there is no significant difference between these two groups. This result appears inconsistent with the results shown in the previous tables. However, given that there are only 27 paired sample in this test, the results may not be as strong as the results shown in the whole sample.

2.5.5 Other Tests

To examine whether different market structures influence liquidity changes of bidders, I compare liquidity changes of bidders that list in different exchanges.

Panel A of Table 15 examines liquidity changes of successful bidders that list in different exchanges. It shows that successful bidders that list in NYSE and NASDAQ have significant improvements in liquidity after the takeovers. However, successful bidders that list in AMEX do

Table 14. Liquidity Changes for Multiple Bidders

This table examines and compares the liquidity changes of a group of paired bidders. These paired bidders compete to acquire the same target firm, while in the end one completes the takeover successfully and the other withdraws its takeover attempt. Panel A shows the changes in the time-weighted relative quoted spreads and the relative effective spreads. Panel B shows the changes in the time-weighted quoted absolute spreads, the absolute effective spreads and the time-weighted depth. The absolute quoted spread is the difference between the ask price and the bid price of a quote. The absolute effective spread is twice the absolute value of the difference between the trade price and the prevailing quote midpoint. The depth is the average of ask and bid size for a quote. The relative quoted spread is the absolute quoted spread divided by the quoted midpoint. The relative effective spread is the absolute effective spread divided by the prevailing quote midpoint. The time-weighted absolute quoted spread (relative quoted spread, depth) is the absolute quoted spread (relative quoted spread, depth) weighted by the length of time over which each quote is valid. The numbers reported are medians.

	Panel A: Changes in Relative Spreads (%)					
	Relative Quoted Spreads			Relative Effective Spreads		
	Success	Unsuccess	Difference	Success	Unsuccess	Difference
Days (-80,-21)	0.768	0.873		1.00	1.24	
Days (+1, +2)	0.602	0.806		0.91	0.90	
Change	-0.045	-0.09**	0.045	-0.028	-0.061*	0.033
Days (+1,+4)	0.65	0.74		0.904	0.890	
Change	-0.014	-0.130***	0.116	0.016	-0.071**	0.087*
Days (+1, +20)	0.644	0.705		0.922	0.920	
Change	-0.024	-0.063*	0.039	-0.001	-0.035	0.025
Days(+21, +40)	0.700	0.993		0.918	0.937	
Change	-0.007	-0.126**	0.119	-0.029	-0.022	-0.007
Days(+41, +60)	0.761	0.82		0.912	0.912	
Change	-0.088	-0.15**	0.062	-0.001*	-0.0005	-0.0005
Days(+61, +80)	0.782	0.790		0.908	0.856	
Change	-0.062	-0.131**	0.069	-0.0014	-0.0003	-0.0011

(Table 14 cont.)

	Panel B: Changes in Absolute Spreads and Depth								
	Quoted Spreads			Effective Spreads			Depth		
	Success	Unsuccess	Difference	Success	Unsuccess	Difference	Success	Unsuccess	Difference
Days (-80,-21)	0.175	0.175		0.074	0.062		50.24	58.39	
Days (+1, +2)	0.161	0.135		0.069	0.054		50.35	51.11	
Change	-0.0072	-0.01***	0.0028	-0.002	-0.004***	0.002	0.092	6.71	-6.62
Days (+1,+4)	0.172	0.141		0.070	0.054		34.95	62.38	
Change	-0.0065	-0.022***		-0.0002	-0.004***	0.0038*	0.092	5.78	-5.69
Days (+1, +20)	0.169	0.154		0.071	0.053		36.29	74.96	
Change	-0.0065	-0.017***	0.011	0.0026	-0.004***	0.0030**	1.47	6.44	-4.97
Days(+21, +40)	0.172	0.148		0.071	0.054		50.25	79.97	
Change	-0.014*	-0.025**	0.011	-0.0008	-0.0052***	0.0044	-0.45	9.96*	10.41
Days(+41, +60)	0.154	0.150		0.068	0.053		50.91	81.72	
Change	-0.029***	-0.026***	-0.003	-0.002	-0.0057***	0.0037*	-2.47	4.02	6.49
Days(+61, +80)	0.166	0.141		0.068	0.051		37.91	57.38	
Change	-0.031***	-0.026	-0.005	-0.002	-0.007***	0.005*	-1.80	2.156	3.956

* significant at the 0.1 level; ** significant at 0.05 level; *** significant at the 0.01 level

Table 15. Liquidity Changes for Bidders in Different Exchanges

This table shows and compares liquidity changes for bidders that list in different exchanges. Panel A shows and compares the liquidity changes for successful bidders that list in different exchanges, while panel B shows and compares liquidity changes for unsuccessful bidders that list in different exchanges. The absolute quoted spread is the difference between the ask price and the bid price of a quote. The absolute effective spread is twice the absolute value of the difference between the trade price and the prevailing quote midpoint. The depth is the average of ask and bid size for a quote. The relative quoted spread is the absolute quoted spread divided by the quoted midpoint. The relative effective spread is the absolute effective spread divided by the prevailing quote midpoint. The time-weighted absolute quoted spread (relative quoted spread, depth) is the absolute quoted spread (relative quoted spread, depth) weighted by the length of time over which each quote is valid. The numbers reported are medians.

(Table 15 cont.)

Panel A: Successful bidders listed in different exchanges									
	Relative Quoted Spreads (%)			Relative Effective Spreads (%)					
	Nyse	Nasdaq	Amex	Nyse	Nasdaq	Amex			
Days (-80,-21)	0.71	2.25	1.78	0.447	1.71	1.168			
Days (+1, +2)	0.604	1.88	1.681	0.40	1.39	1.28			
Change	-0.044***	-0.192***	-0.037	-0.034***	-0.16***	0.000			
Days (+1,+4)	0.638	1.96	1.686	0.405	1.460	1.20			
Change	-0.042***	-0.175***	-0.003	-0.028***	-0.153***	-0.033			
Days (+1, +20)	0.643	2.00	1.63	0.409	1.52	1.162			
Change	-0.048***	-0.168***	-0.050	-0.028***	-0.145***	-0.049			
Days(+21, +40)	0.649	1.978	1.609	0.413	1.51	1.174			
Change	-0.041***	-0.162***	-0.033	-0.029***	-0.145***	-0.052			
Days(+41, +60)	0.638	2.03	1.587	0.415	1.52	1.156			
Change	-0.058***	-0.167***	-0.062	-0.031***	-0.151***	-0.074			
Days(+61, +80)	0.623	1.93	1.656	0.407	1.49	1.12			
Change	-0.062***	-0.165***	-0.060	-0.033***	-0.157***	-0.025			
	Quoted Spreads			Effective Spreads			Depth		
	Nyse	Nasdaq	Amex	Nyse	Nasdaq	Amex	Nyse	Nasdaq	Amex
Days (-80,-21)	0.174	0.296	0.206	0.056	0.1147	0.071	49.95	19.90	33.81
Days (+1, +2)	0.165	0.262	0.218	0.052	0.099	0.071	49.12	19.79	27.98
Change	-0.0068***	-0.024***	0.0074	-0.003***	-0.011***	0.000	-3.92	-0.00***	-5.49
Days (+1,+4)	0.167	0.262	0.212	0.053	0.103	0.071	47.80	19.79	32.21
Change	-0.0087***	-0.021***	0.0086	-0.002***	-0.010***	0.002	-3.01	-0.00***	-2.25
Days (+1, +20)	0.168	0.267	0.204	0.053	0.102	0.070	51.52	19.71	32.96
Change	-0.0070***	-0.017***	0.0047	-0.002***	-0.008***	-0.001	0.371	-0.053***	-0.55
Days(+21, +40)	0.167	0.260	0.208	0.053	0.103	0.070	50.70	19.71	35.12
Change	-0.0090***	-0.018***	0.0008	-0.003***	-0.009***	-0.0010	-0.579	-0.055***	-3.33
Days(+41, +60)	0.165	0.257	0.200	0.052	0.100	0.068	50.80	19.46	35.97
Change	-0.012***	-0.025***	0.0097	-0.003***	-0.010***	-0.0039	-0.874	-0.047***	-1.526
Days(+61, +80)	0.160	0.250	0.200	0.051	0.098	0.068	51.39	19.40	33.76
Change	-0.015***	-0.032***	-0.00012	-0.0034***	-0.013***	0.0011	-0.246	-0.056***	-2.149
No. of observations	594	866	92	594	866	92	594	866	92

(Table 15 cont.)

Panel B: Unsuccessful bidders listed in different exchanges									
	Relative Quoted Spreads (%)			Relative Effective Spreads (%)					
	Nyse	Nasdaq	Amex	Nyse	Nasdaq	Amex			
Days (-80,-21)	0.632	2.81	3.90	0.392	2.30	2.78			
Days (+1, +2)	0.558	2.99	4.51	0.374	2.33	2.78			
Change	-0.004	0.06***	0.238**	-0.016	0.045***	0.043*			
Days (+1,+4)	0.566	3.05	4.31	0.360	2.25	2.78			
Change	-0.031	0.075***	0.064	-0.000	0.001***	0.19			
Days (+1, +20)	0.576	3.15	0.50	0.364	2.36	3.41			
Change	-0.028	0.135***	0.132**	-0.024	0.094***	0.263***			
Days(+21, +40)	0.575	3.04	5.01	0.392	2.42	2.93			
Change	-0.03	0.154***	0.44***	-0.012	0.072***	0.169**			
Days(+41, +60)	0.561	2.97	4.58	0.380	2.44	2.75			
Change	-0.032**	0.057***	0.0037**	-0.017	0.08***	0.505***			
Days(+61, +80)	0.60	2.93	4.76	0.388	2.26	2.67			
Change	-0.029*	0.02***	0.48**	-0.021	0.024	0.444***			
	Quoted Spreads			Effective Spreads			Depth		
	Nyse	Nasdaq	Amex	Nyse	Nasdaq	Amex	Nyse	Nasdaq	Amex
Days (-80,-21)	0.165	0.201	0.174	0.053	0.080	0.058	71.07	19.43	55.00
Days (+1, +2)	0.144	0.152	0.163	0.044	0.063	0.057	73.33	20	59.75
Change	-0.0124***	-0.043***	0.001	-0.0045***	-0.016	-0.0035	1.396	0.278***	-2.32
Days (+1,+4)	0.147	0.154	0.172	0.048	0.065	0.056	72.27	19.97	66.40
Change	-0.013***	-0.037***	-0.002	-0.005***	-0.014***	-0.004*	-2.70	0.095***	-1.93
Days (+1, +20)	0.146	0.155	0.146	0.047	0.064	0.052	71.55	19.71	74.06
Change	-0.009***	-0.030***	-0.008**	-0.004***	-0.015***	-0.004***	-3.03	0.642***	10.63*
Days(+21, +40)	0.145	0.161	0.151	0.048	0.065	0.055	69.00	19.71	80.83
Change	-0.015***	-0.036***	-0.005*	-0.004***	-0.016***	-0.028***	-2.70	0.538***	5.712
Days(+41, +60)	0.144	0.148	0.141	0.049	0.062	0.051	57.70	20	74.78
Change	-0.016***	-0.042***	-0.016***	-0.0046***	-0.019***	-0.006***	-4.89	0.816***	7.635
Days(+61, +80)	0.145	0.149	0.155	0.048	0.062	0.051	60	20	76.33
	-0.019***	-0.048***	-0.012***	-0.0056***	-0.02***	-0.005***	-4.53	0.763***	3.73
No. of obs	313	159	43	313	159	43	313	159	43

* significant at the 0.1 level; ** significant at the 0.05 level; *** significant at the 0.01 level

Table 16. Changes in Price, Number of Market Makers, Number of Trades Per Day, Daily Trading Volume and Daily Dollar Volume between Successful and Unsuccessful Bidders

This tables shows and compares changes in price, number of market makers, number of trades per day, daily trading volume and daily dollar volume between successful and unsuccessful bidders before and after the takeover. The pre-takeover window goes from 80 to 21 days before the initial announcement of the takeover, and the post-takeover window goes from 21 to 80 days after the effective/withdrawal date of the takeovers. Numbers reported are the means.

	Success			Unsuccess			Diff in changes
	Before	After	Changes	Before	After	Change	
Price	22.63	22.33	-0.3	19.73	16.98	-2.75***	2.45***
Market Maker	16.19	17.49	1.294***	18.91	19.84	0.934***	0.360*
Number of trades per day	168	240	72.02***	402	401	-0.74	72.76***
Daily Dollar Volume	9195940	12075197	2879257***	21585325	20065835	-1519490	4398747***

* significant at the 0.1 level; ** significant at the 0.05 level; *** significant at the 0.01 level

not have any significant changes in liquidity after the takeovers. Panel B of Table 15 examines liquidity changes of unsuccessful bidders that list in different exchanges. Unsuccessful bidders that list in AMEX and NASDAQ have significant decreases in liquidity after they withdraw their takeovers, but unsuccessful bidders that list in NYSE have similar liquidity as their pre-takeover level after they withdraw their takeovers.

Table 16 examines and compares changes in price, number of market makers, number of trades per day, daily dollar trading volume between successful and unsuccessful bidders.

The price does not change significantly for successful bidders after they complete their takeovers. However, the price decreases significantly for unsuccessful bidders after they withdraw their takeovers.

Both successful and unsuccessful bidders have more market makers after the takeovers. However, successful bidders have more increases in market makers than unsuccessful bidders. For the trading activities, successful bidders have significantly more trades and more dollar trading volume per day after they complete their takeovers while unsuccessful bidders have decreases (though insignificant) in dollar trading volume and trades per day. Changes in number of market makers and trading activities could be classified as changes related to firm characteristics.[5] More market makers and more active trading improve a firm's liquidity. Therefore, evidence in Table 16 also supports the *firm characteristics hypothesis*.

2.5.6 Multivariate Test

To examine whether the relations found in the univariate analysis also hold in a multivariate analysis, I examine a group of regressions as:

[5] As discussed in the methods part: The *information production hypothesis* only refers to the effect of the information produced during the takeover process on bidders' liquidity. It does not consider the information produced after the takeover process. In contrast, all changes after the takeovers, including changes in the level of information produced for the bidders, are classified as changes in firm characteristics or changes related to firm characteristics.

$$liquiditychanges = \alpha + Group1Variables + Group2Variables$$

where group1 variables are proxies for the information produced during the takeover process and group2 variables are proxies for the changes in firm characteristics. Group1 variables include changes in the number of analysts during the takeover process and the time a takeover takes from announcement to completion/withdrawal. Group 2 Variables include the dummy of success, the dummy of public, changes in the number of analysts after the takeover, changes in the number of market makers (this only refers to Nasdaq firm), changes in the dollar trading volume, deal value and changes in price. The dummy of success equals to 1 when the takeover is successful and 0 otherwise; the dummy of public equals to 1 when the bidder acquires or tries to acquire a public target and 0 otherwise; the dummy of cash equals to 1 when the bidder is successful and uses cash as the medium of exchange. Because the dependent variables are highly skewed, I winsorized the dependent variables at the 1 percent and 99 percent level. That is, if the dependent variable is greater(smaller) than its 99 (1) percent value, I set it to its 99 (1) percent value. Table 17 reports the regression results and Table 18 reports the correlation coefficients of the independent variables.

In the multivariate analysis, I examine the determinants of changes in relative quoted spreads, changes in relative effective spreads and changes in probability of information-based trading. To each dependent variable, I run two separate regressions[6]. The regression results show that most of the relations found in the univariate analysis also hold in the multivariate analysis.

In particular, almost none of the independent variables that proxy for information produced in the takeover process play a significant role in explaining changes in liquidity. The only exception is in regression (6). In regression (6), when explaining the changes in PIN, the variable

[6] I have run a lot other combinations, and results are similar.

Table 17. Regression Results

This table presents the results of the regression: $LiquidityChanges = \alpha + Group1Variables + Group2Variables$ where group1 Variables refer to the variables proxied for information produced during the takeover process and group2 Variables refer to the variables proxied for the changes in firm characteristics. Particularly, variable success, public and cash are dummy variables. Success equals to 1 if the takeover is successful and 0 otherwise, public equals to 1 if the takeover is a public takeover and 0 otherwise, and cash equals to 1 if the takeover uses cash as a medium of exchange. The dependent variables are winsorized at the 1 percent and 99 percent levels. The numbers reported in the parentheses are t-values.

	Log Δ Quoted Spreads (1)	Log Δ Quoted Spreads (2)	Log Δ Relative Spreads (3)	Log Δ Relative Spreads (4)	Log Δ PIN (5)	Log Δ PIN (6)
Intercept	0.074**	0.013	0.066*	0.024	0.017	0.023
	(1.941)	(0.278)	(1.774)	(0.523)	(1.360)	(1.209)
Group1 Variables: Information Produced during the takeover						
Log Δ # Analysts		-0.074		-0.031		0.042
		(-1.099)		(-0.458)		(1.547)
Time to completion/withdraw	0.000	0.000	0.000	0.000	0.000	0.000
	(0.371)	(-0.956)	(0.242)	(-1.622)	(-0.295)	(2.087**)
Group2 Variables: Changes in firm characteristics						
Success	-0.094***	-0.011	-0.085***	-0.004	-0.012	0.004
	(-3.639)	(-0.374)	(-3.375)	(-0.151*)	(-1.298)	(0.329)
Public	-0.058**	-0.085***	-0.035	-0.051	-0.012	0.004
	(-2.208)	(-3.016)	(-1.369)	(-1.796)	(-1.438)	(0.389)
Cash	-0.024	0.050*	-0.013	0.064**	0.007	0.000
	(-1.087)	(1.836)	(-0.601)	(2.311)	(1.014)	(0.034)
Log Δ # Analysts	-0.257***	0.021	-0.284***	-0.048	-0.006	-0.022
	(-7.766)	(0.446)	(-8.786)	(-1.005)	(-0.524)	(-1.092)
Log Δ # Market Makers		-0.284***		-0.265***		-0.017
		(-8.048)		(-7.490)		(-1.098)
Log Δ Trading Volume		-0.108***		-0.074***		-0.005
		(-5.405)		(-3.696)		(-0.661)
Log deal value	-0.008	-0.016**	-0.009	-0.022***	-0.003	-0.012***
	(-1.252)	(-1.884)	(-1.368)	(-2.518)	(-1.237)	(-2.745)
Log Δ Price		-0.391***		-0.408***		0.014
		(-10.003)		(-10.395)		(0.770)
Adjusted R-square	0.07	0.52	0.07	0.48	0.004	0.022
Number of Observations	1140	539	1138	538	843	326

* significant at the 0.1 level; ** significant at the 0.05 level; *** significant at the 0.01 level

Table 18. Correlation Coefficients

This table presents the correlation coefficient of the dependent variables used in the regression shown in table 17.

	Log Δ # Analysts_1	Time to completion	Success	Public	Cash	Log Δ # Analysts_2	Log Δ # Market Makers	Log Δ Trading Volume	Log deal value	Log Δ Price
Log Δ # Analysts_1	1									
Time to completion	-0.042	1								
Success	-0.021	-0.175	1							
Public	-0.052	-0.106	0.082	1						
Cash	-0.052	0.216	-0.220	-0.179	0.073	1				
Log Δ # Analysts_2	0.650	-0.083	0.099	-0.065	0.046	-0.073	1			
Log Δ # Market Makers	0.081	-0.075	0.031	-0.042	0.048	-0.019	0.154	1		
Log Δ Trading Volume	0.064	-0.044	0.168	0.027	0.044	0.021	0.211	0.299	1	
Log deal value	-0.032	0.206	0.032	-0.067	0.101	0.360	-0.021	0.014	0.120	1
Log Δ Price	0.068	-0.159	0.181	0.132	0.000	-0.102	0.249	0.082	0.604	-0.095

"time to completion" is significant at the 0.05 level. The results in Table 16 thus suggest that the information produced during the takeover process does not drive the liquidity improvements for successful bidders.

In contrast, variables that proxy for the changes in firm characteristics play a significant role in explaining changes in liquidity or changes in PIN. Specifically, the dummy of success is significant in regression (1) and (3), implying that if a takeover is completed, the bidder will enjoy significant improvements in liquidity. However, the dummy of success is not significant in regression (2) and (4) when I add four more independent variables that proxy for changes in firm characteristics. This evidence suggests that the driving factor of liquidity improvements is changes in firm characteristics. In addition, Table 17 also shows that the size in deal value influences the improvements in liquidity positively; increases in market makers also contributes to the improvements in liquidity.

On the whole, the multivariate analysis supports the results of the univariate analysis. That is, the information generated during the takeover process does not drive the liquidity improvements; changes in firm characteristics, as the increase in firm size and/or the effect of bundling claims together, appear to be the driving factor of liquidity improvements for the bidders.

I also do some analysis on the determinants of liquidity and examine whether the determinants have any structural change after the takeover. I do not find any significant structural change in the determinants.

2.6 Conclusions

I find that liquidity improves following successful acquisitions. Broadly speaking, two factors could drive the liquidity improvement for successful bidders: information generated during the takeover process and changes in bidders' firm characteristics (changes in firm size or

Table 19. Chow Test of Structural Changes in the Determinants of Liquidity

This table presents the chow-test results of structural changes in the determinants of liquidity for successful bidders before and after the takeovers. The independent variable is logarithm of quoted relative spreads. The dependent variables are analysts' coverage, logarithm of dollar trading volume, logarithm of number of trades, logarithm of firm size, and number of market makers.

	Log(Quoted Spreads)
Intercept	-1.400***
	(-8.46)
Analyst Coverage	0.005**
	(2.07)
Log(Dollar Trading)	-0.016
	(-0.74)
Log(Number of Trades)	-0.208***
	(-9.65)
Log(Firm Size)	-0.075***
	(-4.53)
Log(Stock Price)	-0.313***
	(-11.56)
Number of Market Makers	-0.018***
	(-8.68)
Obs.	1028
Chow-Test p_value	0.257

* significant at the 0.1 level; ** significant at the 0.05 level; *** significant at the 0.01 level

the effect of bundling two claims together). To distinguish between these two factors, I study the liquidity/information asymmetry changes for unsuccessful bidders. I find that unsuccessful bidders do not have liquidity improvement after they withdraw the takeovers. Since unsuccessful takeovers also generate public information during the process, my findings suggest that changes in firm characteristics, and not information produced during the takeover process, provide the primary impetus for liquidity improvement.

Secondly, I find that bidders that acquire public firms enjoy similar liquidity improvements as bidders that acquire private firms, but bidders that acquire public firms enjoy more reductions in information asymmetry than bidders that acquire private firms. This finding is consistent with the firm-characteristics hypothesis (in this case, increases in firm size), since in my sample bidders that acquire public targets increases significantly more in firm-size (in both absolute and relative terms) than bidders that acquire private firms. Furthermore, this evidence suggests that liquidity, as a source of gain for the bidder, could influence a bidder's takeover decision between a private target and a public target.

Third, this essay documents that successful bidders that use stock as the method of payment enjoy more liquidity improvements than those that use cash as the method of payment. I also find that for private bidders, the difference in liquidity changes between stock and cash takeovers is great. This evidence lends support to the bundling claim hypothesis and Merton (1987) investor base hypothesis. My findings also support the adverse selection hypothesis that informed investors lose their information advantage when facing a basket of securities.

Chapter 3 Liquidity and Market Monitoring: An Examination of Changes in Market Monitoring for Successful Bidders

3.1 Introduction

The purpose of this article is to examine the effect of a firm's liquidity, measured as the firm's bid-ask spread, on its external monitoring. I study two research questions - Does the change in liquidity influence the information content of the bidder's price? Does the change in liquidity influence the post-takeover performance of the bidder? The arguments of Holmstrom and Tirole (1993) suggest that improvements in liquidity lead to improvements in external monitoring. Since greater market monitoring improves a company's performance, it is reasonable to expect the firm's performance to improve as its liquidity improves. In essay one, I find that corporate takeovers influence the liquidity of a firm. To gain insight into how liquidity changes affect the incentives to monitor, I use corporate takeovers as liquidity-changing events and examine how changes in liquidity affect (i) the information content of the stock price (ii) the subsequent operating performance of the firm and (iii) changes in firm value.

Based on a sample of 1,362 acquisitions from 1995 to 2001, I form two groups of successful bidders, one with liquidity improvement (LI group) and one with a liquidity decrease (LD group). Hasbrouck (1993) argues that low pricing errors indicate that the stock price is more informative. Consistent with the proposition that liquidity improves the information content of the stock price, I find that the pricing errors for the LI group decrease significantly after the takeover but the pricing errors for the LD group increase significantly. The number of institutional investors (a proxy for external monitoring) and the percentage of shares they hold increases significantly more for the LI group than for the LD group.

I then compare changes in stock price performance, operating performance and firm value (as measured by Tobin's Q) for the LI and the LD groups. I find that LI group has relatively

better operating performance/firm value than LD group in all scenarios. That is, to a particular performance measure (for example, industry-controlled return on assets, or industry-and-performance controlled return on asset, etc), LI group either has more improvement over its pre-takeover level or has less decrease over its pre-takeover level than the LD group. These results support the argument that the LI group has better monitoring and thus has better performance than the LD group. I do not find any significant difference on stock performances between the LI and LD bidders, possibly because the market capitalizes the operating performance changes at the time of the acquisition.

My results add to the understanding of the relations between liquidity, institutional ownership, monitoring, and the governance of publicly held firms. Agency problems arise within a firm when managers have incentives to pursue their own interests at shareholder expenses. External monitoring is one of many mechanisms used to control this manager-shareholder agency problem. Different from internal monitoring that is decided within the firm, firms do not have direct control on its external monitoring. Kyle (1985) argues that greater liquidity enables informed parties to disguise their private information and make profits on it. Building on Kyle's work, Holmstrom and Tirole (1993) show that as liquidity increases, the marginal value of information goes up and the informed investors have stronger incentives to gather information and to monitor the firm since they are better able to profit from their actions. Cremers and Nair (2005) find that firms with strong shareholder rights and high ownership by activist institutions outperform firms without both attributes. My study adds to this literature by examining empirically the relation between stock liquidity and external monitoring.

To examine the relation between liquidity and external monitoring helps understand better how public trading of a firm's stock influences the firm's external monitoring and its managerial

incentives. As Holmstrom and Tirole (1993) argue, public trading of a firm's stock influences its external monitoring/managerial incentive in two ways:

"First, a poorly performing firm may become a target for a takeover. If it is assumed that managers will be fired if a takeover succeeds, this threat will help curb managerial misbehavior (though it may also have less desirable effects, such as managerial myopia). Less dramatically, public trading allows managerial incentives to be provided according to the continuing performance of the firm's share price."

Though public trading influences a firm's managerial incentive in two ways, the extant literature has focused the attention only on the first way - the corporate control aspect. For example, Martin and McConnell (1991) document that after successful completion of the takeover, the turnover for the top manager of the poor-performing target firm increases significantly. Scharfstein (1988) presents a model showing that the takeover threat mitigates the agency problem of the potential target firm. Mitchell and Lehn (1990) show that the bidders that make value-decreasing takeovers are more likely to become takeover targets themselves. This essay seeks to fill in the void by shedding light on how public trading influences a firm's managerial incentive via the second way –continuously align the manager's interests with shareholders through a more informative stock price.

3.2 Data

I collect from the Securities Data Corporation's (SDC) Mergers and Acquisitions (M&A) Database a list of successful mergers and tender offers for domestic targets, with the initial bid announced between April 1st, 1995 and December 31st, 2001. To be included in the analysis, an acquisition must meet the following criteria. (1) The announcement date and the effective date of the takeover can be verified through the Lexis/Nexis; (2) The bidder is a U.S. firm listed on the

NYSE, AMEX or Nasdaq; (3) The bidder has 300 days of return data on CRSP and 60 days of transaction data in the NYSE Trade and Quote Database (TAQ) before and after the announcement and effective date of the takeover; (4) The successful bidder acquires more than fifty percent and owns one hundred percent of the target firm's shares after the takeover; (5). For a successful takeover, its deal value is over 10 percent of the bidder's market value two weeks before the takeover announcement; (6). The firm does not attempt another takeover between its pre- and post- takeover event window; (7). The bidder's stock price is above three dollars; (8).The takeover does not have such confounding events as stock split, addition into and deletion from the market index.

The accounting data comes from the Compustat database, blockholder data from Wharton Research Database[7], institutional shareholding data from Compact Disclosure and Fama-French factor and Carhart momentum factor from Kenneth French's website (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/index.html). The final sample consists of 1,362 successful bidders.

I divide the 1362 successful bidders into the liquidity improved (LI) group, the liquidity decrease (LD) group and the liquidity unchanged (LU) group. The LI group consists of the bidders whose relative effective spreads decrease significantly at the 1 percent, 5 percent or 10 percent level after the takeover, the LD group includes bidders whose relative effective spreads increase significantly at the 1 percent, 5 percent or 10 percent level, and the LU group consists of bidders whose relative effective spreads do not change significantly. Table 20 presents the summary statistics for these three groups. As a robustness check, I divide the sample by changes in the quoted relative spreads, and all the empirical results are qualitatively similar.

[7] The blockholder data is provided by Dlugosz, Fahlenbrach, Gompers and Metrick (2004)

Table 20. Summary Statistics

I obtain the liquidity improved (LI) group, the liquidity decrease (LD) group and the liquidity unchanged (LU) group from the successful takeover sample[8]. LI group consists of the bidders whose relative effective spreads decrease significantly at the 1%, 5% or 10% level after the takeover, LD group includes bidders whose relative effective spreads increase significantly at the 1%, 5% or 10% level, and LU group includes bidders whose relative effective spreads do not change significantly. If the target firm is a private firm, I classify this takeover as a private takeover. If the target firm has the same first two-digit SIC code as the bidder, I classify this takeover as a related takeover. If the medium of exchange in the takeover is cash, I classify this takeover as a cash takeover. The market value and transaction value are in millions.

Panel A: Sample Distribution						
	LI Group		LD Group		LU Group	
	No.	Percent	No.	Percent	No.	Percent
Private Takeover	267	38	171	36	106	44
Related Takeover	434	62	247	52	153	63
Cash Takeover	319	46	198	42	138	57
Total Takeover	700	100	406	100	256	100
Panel B: Sample Characteristics						
	Mean	Median	Mean	Median	Mean	Median
Δ in effective Spreads	-0.0041	-0.0023	0.0037	0.0023	0.0000	0.0000
Bidder Size	1154.05	281.84	1549.62	226.4	846	188
Transaction Value	581.74	95.14	805.2	83.4	261	64
% Transaction Value	0.63	0.32	0.67	0.25	0.56	0.27

[8] The successful takeover sample is taken from Essay 1 of my dissertation. The sample description can be found in the "Data and Methods" part in Essay 1.

Panel A of Table 20 presents the distributions of the LI group, the LD group and the LU group across different types of takeovers. If the target firm is a private firm, I classify this takeover as a private takeover. If the target firm has the same first two-digit SIC code as the bidder, I classify this takeover as a related takeover. If the medium of exchange in the takeover is cash, I classify this takeover as a cash takeover. LI group has 700 observations, LD group has 406 and LU group has 256 observations respectively. Panel A shows that LI and LD groups have similar distribution across different types of takeovers. Panel B shows that on average, the LD group has the greatest bidder size and transaction value, while the LU group has the smallest. Still, the relative size of the transaction ((transaction value)/(bidder size)) is comparable in all three groups.

3.3 Methods

3.3.1 Price Informativeness

Kyle (1985), and Holmstrom and Tirole (1993) suggest that the informativeness of a stock price reflects the level of market monitoring of a company. Therefore, as a test of the changes in the level of market monitoring for each bidder, I examine the changes in the price informativeness for each bidder.

I apply the Hasbrouck (1993) pricing error standard deviation to measure the price informativeness of each bidder before and after the takeover. Compared with other microstructure measures (e.g. PIN) that consider only private information, the Hasbrouck (1993) pricing error standard deviation considers both private and public information and provides a measure of the total information content of a stock price more.

Hasbrouck (1993) decomposes the transaction price into an implicit efficient price and a pricing error. $p_t = m_t + s_t$, where m_t is the efficient price conditioned on both public and

private information, and s_t is the pricing error. The efficient price m_t follows a random walk: $m_t = m_{t-1} + w_t$. The standard deviation of s_t, pricing error standard deviation, is a summary measure of market quality, or a measure of information content of the stock. Following Hasbrouck (1993), I apply the vector autoregressive model (VAR) to estimate pricing error standard deviation for each bidder before and after the takeover. The variables I use in the vector autoregressive model include: the return of each transaction, trade direction (I classify the trade direction following Lee and Ready 1991, that is, if it is a buy, trade direction equals 1; if it is a sell, trade direction equals -1), signed trading volume of each transaction (signed by the trade direction), and signed square root of trading volume of each transaction (signed by the trade direction). I assume that there are 5 lags in the vector autoregressive model. My results are robust if I use 3 or 6 lags in the vector autoregressive model.

3.3.2 Stock Price Performance

I examine the long-term stock returns of the bidders to see how changes in liquidity influence the bidders' stock performance. If greater liquidity increases the level of a firm's external monitoring and greater external monitoring improves a company's performance, I expect to observe a positive impact of liquidity on a firm's stock performance. It is possible that this impact is capitalized into the price at the time of the takeover. If this is the case, I will not be able to find any significant impact of liquidity changes on a firm's long term stock performance.

There has been a lot of debate surrounding the existence/methods of long-term abnormal stock returns. For example, Fama (1998) argues that most long-term abnormal stock return results are vulnerable to the mismeasurement of risks (bad model problem). One way to deal with this bad-model problem is to examine the robustness of the results using different methods.

In this essay, I apply three different methods to examine bidders' long-term abnormal stock returns.

First, I examine the annual industry-adjusted return for the bidders. As in Clark and Ofek (1994), I subtract the median/mean return of all firms with the same first two-digit[9] SIC code from the bidder's return, and get the mean and median for the LI and the LD groups. The industry-adjusted returns indicate the bidders' performance relative to their industries before and after the takeovers. I further examine changes in industry-adjusted returns for bidders that make public takeovers. For these bidders, I calculate their pre-takeover stock return as the return of the bidder and the target before the takeover weighted by their firm sizes.

Second, I apply the Fama-French (1993) three-factor model to detect the long-term abnormal return of bidders before and after the takeovers. The Fama-French three-factor model is:

$$R_{it} - R_{ft} = \alpha + b(R_{mt} - R_{ft}) + sSMB_t + hHML_t + \varepsilon_{pt}$$

Where R_{it} is the return of firm i in month t, R_{ft} is the one-month T-Bill return in month t, R_{mt} is the CRSP market return, SMB_t is the return of a portfolio of large firms minus the return of a portfolio of small firms, HML_t is the return of a portfolio of stocks with high book-to-market ratios minus the return of a portfolio of stocks with low book-to-market ratios. I regress each bidder's return on these Fama-French factors, obtain the abnormal return (alpha) for each bidder and calculate the average abnormal return for the LI and LD groups respectively. I use monthly return to detect the abnormal return. For robustness, I examine the abnormal returns

[9] As a robustness check, I also subtract the median/mean return of all firms with the same three-digit SIC code from the bidders' return. The results are quantitatively and qualitatively similar.

using both the value-weighted and equal-weighted market return. I correct the standard errors in the above equation for heteroskedasticity and autocorrelation.

My third measure is built on Fama-French three factor model. Following Carhart (1997), I add a momentum factor to the Fama-French three factors:

$$R_{it} - R_{ft} = \alpha + b(R_{mt} - R_{ft}) + sSMB_t + hHML_t + mUMD_t + \varepsilon_{pt}$$

where UMD_t is the return of high momentum stocks minus the return of low momentum stocks. Carhart (1997) includes a momentum factor in the analysis to make up for the three-factor model's inability to explain cross-sectional variation in momentum-sorted portfolio returns.

3.3.3 Operating Performance

To directly measure the operating efficiency, I examine the changes in operating performance for each group. One advantage of examining operating performance is that it can avoid the debate over market efficiency and long run methodology. To be comprehensive, I examine six different operating performance measures in this essay: operating income before depreciation scaled by sales; operating income before depreciation scaled by assets; operating income after depreciation scaled by sales; operating income after depreciation scaled by assets; net income scaled by sales and net income scaled by assets. Among these six different measures, operating income before depreciation scaled by sales is not vulnerable to the mechanical effects of the accounting method (pooling or purchase accounting) and the financing method (cash or equity) of the merger (Heron and Lie, 2002).

I examine these six measures using three different methods. First, I examine their raw performance. Second, to control for changing industry and economy-wide conditions, I compute the industry-adjusted performance by comparing the operating performance of the sample to the median operating performance of firms in the same first two-digit SIC code. Third, to control for

possible mean-reverting characteristics of accounting numbers, I compute the industry and pre-performance adjusted performance by comparing the operating performance of the sample firms to that of a control firm in a similar industry with similar pre-event performance (Barber and Lyon, 1996). To construct this control sample, I first identify firms that has the first two-digit SIC code as the sample firm. Among these firms, I select the firms whose pre-performance lies within 10% of the sample firm, and then choose among these firms one control firm that has the closest operating performance as the sample firm. If no control firm can be obtained using this method, I use one digit SIC code to identify firms that are in the same industry, select the firms whose pre-performance lies within 10% of the sample firm, and choose one control firm with the most similar pre-performance. If still no control firm can be obtained, I choose the control firm as the one that has the same first two-digit SIC code as the sample firm and has the closest operating performance. In this way, I find for each sample firm one control firm. [10]

3.3.4 Firm Value, Blockholder and Institutional Investor

I examine changes in firm value, as measured by Tobin's Q, for the LI group and the LD group. Tobin's Q is measured as the market value of assets divided by the book value of assets. The market value of assets is the sum of the book value of assets and the market value of stocks, minus the book value of common stock and deferred taxes. I measure for each bidder its raw Tobin's Q, and its industry-adjusted Tobin's Q. The industry-adjusted Tobin's Q is calculated as the firm's raw Tobin's Q minus the median Tobin's Q of a group of firms that have the same first two-digit SIC code as the bidder.

[10] I also find for each bidder a group of firms that have the same first two-digit SIC code and similar pre-performance (within a 10 percent range) and use the median of this group of firms as a control. The results are similar.

Blockholders and institutional investors are both used in literature as proxy for external monitoring. I examine changes in number of blockholders/institutional investors and changes in percentage of shares held by blockholders/institutional investors for the LI and LD groups respectively.

3.4 Empirical Results

3.4.1 Comparison of Changes in Price Informativeness for LI and LD Groups

Table 21 presents the changes in Hasbrouck (1993)'s pricing error standard deviations for the LI and LD groups respectively.

The pricing error standard deviation is 0.0039 for the LI group before the takeover. It decreases to 0.0026 after the takeover, and the paired difference -0.0008 is significantly smaller than zero. For the LD group, however, the result is just the opposite. The paired pricing error standard deviation increases 0.0004 after the takeover, which is significantly greater than zero. Furthermore, the difference in the change of pricing error standard deviation between the LI and the LD groups is significantly different from zero. This evidence suggests that the price becomes more informative for the LI group but becomes less informative for the LD group. If, as proposed by Holmstrom and Tirole (1993), the informativeness of a stock price reflects the level of market monitoring of a company, this evidence implies that the LI group has a higher level of market monitoring after the takeover while the LD group has a lower level market monitoring after the takeover.

3.4.2 Comparison of Changes in Equity Returns for LI and LD Groups

The results in Table 21 suggest that the price becomes more informative for the LI group but becomes less informative for the LD group. Holmstrom and Tirole (1993) argue that the informativeness of a firm's stock price reflects the level of external monitoring on this firm. My

Table 21. Pricing Error Standard Deviation of Bidders

Hasbrouck (1993) decomposes the transaction price into an implicit efficient price and a pricing error. $p_t = m_t + s_t$, where m_t is the efficient price conditioned on both public and private information, and s_t is the pricing error. The efficient price m_t follows a random walk: $m_t = m_{t-1} + w_t$. The standard deviation of s_t is a measure of information content of the stock. Following Hasbrouck (1993), I apply the vector autoregressive model (VAR) to estimate pricing error standard deviation for each bidder before and after the takeover. The variables I use in the vector autoregressive model include: the return of each transaction, trade direction (if it is a buy, trade direction equals 1; if it is a sell, trade direction equals -1), signed trading volume of each transaction (signed by the trade direction), and signed square root of trading volume of each transaction (signed by the trade direction). I assume that there are 5 lags in the vector autoregressive model. I report medians in the table.

	LI Group	LD Group	Difference
Pre-announcement Days (-80,-1)	0.0039	0.0032	
Post-takeover Days (1,80)	0.0026	0.0036	
Change	-0.0008***	0.0004***	-0.0012***
(p-value)	(<0.0001)	(<0.0001)	(<0.0001)

* significant at the 0.1 level
** significant at the 0.05 level
*** significant at the 0.01 level

result so far thus suggests that LI group has more informative prices after the takeover than the LD group, which should encourage more external monitoring. External monitoring helps reduce the agency problem between managers and shareholders and thus should improve the firm's performance.

Table 22 presents and compares the industry-adjusted stock returns of the LI and LD groups respectively. Panel A of Table 22 presents the result when the control return is the industry mean return while panel B displays the result when I use the industry median return as the benchmark. In Table 22 I classify firms into a same industry based on their first two-digit SIC code. Though I examine the equity returns from one to three years after the takeovers, I focus my analysis on the one year after the takeovers.

If simply looking at the changes in the industry-adjusted stock returns, Table 22 shows that LI group has a relatively smaller decrease in the industry-adjusted stock returns than the LD group. However, the differences in changes between these two groups are not significantly different. For example, Panel A shows that the median industry-adjusted stock return (adjusted for industry mean return) of the LI group goes from 0.86 percent to -6.9 percent one year after the takeover, a drop of 10.8 percent. The median industry-adjusted stock return for the LD group has a comparable decrease of 12.3 percent, which is greater but not significantly greater than the decrease of stock equity returns for the LI group. Panel B has the qualitatively similar results as Panel A if I examine and compare changes in industry-adjusted stock returns between these two groups.

Table 23 presents and compares the industry-adjusted stock returns for bidders that acquire public targets. Overall, results in Table 23 show no significant difference in changes of the industry-adjusted stock returns between the LI and LD groups. Different from the whole sample,

Table 22. Industry Adjusted Stock Returns

This table presents the annual industry-adjusted return for the bidders around the takeovers. Following Clark and Ofek (1994), I subtract the median/mean return of all firms with the same two-digit SIC[11] code from the bidder's return, and report the mean and median for the LI and the LD groups. Year –1 is the year before the takeover announcement, and year 1 is the year after the takeover effective date. The difference test tests the significance of the difference in changes in mean/median industry-adjusted annual returns.

	LI Group				LD Group				Difference	
Year	Mean	Median	%Positive	Obs	Mean	Median	%Positive	Obs	Mean	Median
Panel A. Adjusted for industry mean return										
-1	0.167	0.0086	51.57	700	0.082	-0.014	48.77	406		
1	0.0048	-0.069	42.02	664	-0.056	-0.113	39.40	368		
	-0.168***	-0.108***			-0.176***	-0.123***			0.008	0.015
2	-0.106	-0.162	35.05	602	-0.067	-0.138	39.27	331		
	-0.285***	-0.186***			-0.216***	-0.130***			-0.069	-0.056
3	-0.011	-0.121	39.15	539	0.038	-0.127	40.86	301		
	-0.195***	-0.162***			-0.120	-0.088***			-0.075	-0.074
Panel B. Adjusted for industry median return										
-1	0.360	0.163	67.14	700	0.312	0.164	65.02	406		
1	0.216	0.093	58.43	664	0.166	0.033	53.53	368		
	-0.149***	-0.071***			-0.178***	-0.138***			0.029	0.067
2	0.120	0.017	52.16	602	0.168	0.034	53.17	331		
	-0.255***	-0.124***			-0.199***	-0.160***			-0.056	0.036
3	0.214	0.050	55.66	539	0.261	0.046	55.48	301		
	-0.165***	-0.129***			-0.120***	-0.125***			-0.045	-0.004

* significant at the 0.1 level
** significant at the 0.05 level
*** significant at the 0.01 level

[11] I also classify firms into different industrial categories by their first three-digit SIC code, and the results are statistically similar.

Table 23. Industry-Adjusted Stock Returns for Public Takeovers

This table presents the annual industry-adjusted return for the bidders that make public takeovers around the takeovers. Following Clark and Ofek (1994), I subtract the median/mean return of all firms with **the same two-digit SIC code** from the bidder's return, and report the mean and median for the LI and the LD groups. Year –1 is the year before the takeover announcement, and year -1 return is calculated as the return of the bidder and the target of the year before the takeover announcement weighted by their size. Year 1 is the year after the takeover effective date. The difference test tests the significance of the difference in changes in mean/median industry-adjusted annual returns.

	LI Group				LD Group				Difference	
Year	Mean	Median	%Positive	Obs	Mean	Median	%Positive	Obs	Mean	Median
Panel A: Adjusted for industry mean return										
-1	0.157	0.027	53.8	184	-0.014	-0.039	45.7	92		
1	-0.069	-0.070	39.09	197	-0.045	-0.060	41.7	96		
	-0.228***	-0.114***			-0.047	-0.074			-0.181	-0.040
2	-0.082	-0.093	40.66	182	-0.105	-0.175	35.6	87		
	-0.228***	-0.104**			-0.130	-0.158			-0.098	0.054
3	-0.030	-0.089	36.90	168	-0.143	-0.130	37.0	81		
	-0.188	-0.115			-0.153*	-0.118			-0.035	0.003
Panel B: Adjusted for industry median return										
-1	0.357	0.181	71.2	184	0.208	0.155	65.2	92		
1	0.158	0.079	55.8	197	0.185	0.068	57.3	96		
	-0.205***	-0.124***			-0.033	-0.039			-0.172	-0.085
2	0.129	0.076	56.0	182	0.082	-0.001	50.6	87		
	-0.226***	-0.085***			-0.161**	-0.202***			-0.064	0.118
3	0.201	0.060	57.1	168	0.095	-0.007	49.4	81		
	-0.170**	-0.102***			-0.139**	-0.171***			-0.031	0.070

* significant at the 0.1 level
** significant at the 0.05 level
*** significant at the 0.01 level

Table 24. Long-term Abnormal Stock Returns

This table provides long-term abnormal stock returns of the liquidity-improved and liquidity-decreased bidders. The models used to detect long-term abnormal stock returns is the Fama-French (1993) three-Factor Model,

$$R_{it} - R_{ft} = \alpha + b(R_{mt} - R_{ft}) + sSMB_t + hHML_t + \varepsilon_{pt}$$

where R_{it} is the return of firm i, R_{ft} is the one-month T-Bill return, R_{mt} is the CRSP market return, SMB_t is the return of a portfolio of large firms minus the return of a portfolio of small firms, HML_t is the return of a portfolio of stocks with high book-to-market ratios minus the return of a portfolio of stocks with low book-to-market ratios. I also estimate the abnormal stock returns with a momentum factor (Carhart, 1997)

$$R_{it} - R_{ft} = \alpha + b(R_{mt} - R_{ft}) + sSMB_t + hHML_t + mUMD_t + \varepsilon_{pt}$$

where UMD_t is the return of high momentum stocks minus the return of low momentum stocks. Following Andrew (1991), I correct the standard errors in the above equations for heteroskedasticity and autocorrelation. Panel A presents the results where the market return is the CRSP equally-weighted market return and Panel B presents the results where the market return is the CRSP value-weighted market return.

(Table 24 cont.)

Panel A. Results using equally-weighted market index										
Fama-French Three Factor Model										
Year	LI Group					LD Group				
	Intercept	b	s	h		Intercept	b	s	h	
-2	-0.380***	0.008***	0.009***	0.001		-0.374***	0.012***	0.010***	0.005	
	(-36.640)	(3.359)	(3.788)	(0.267)		(-33.457)	(4.656)	(3.564)	(1.160)	
-1	-0.391***	0.011***	0.007***	0.001		-0.402***	0.009***	0.007***	0.000	
	(-43.134)	(3.853)	(3.387)	(0.282)		(-43.873)	(3.792)	(3.564)	(0.132)	
1	-0.359***	0.008**	0.010***	0.000		-0.367***	0.015**	0.010*	0.005	
	(-22.222)	(2.356)	(3.158)	(0.047)		(-14.864)	(2.038)	(1.802)	(0.688)	
2	-0.331***	0.013***	0.013***	0.006		-0.332***	0.011**	0.014***	0.007	
	(-16.010)	(3.120)	(3.036)	(0.940)		(-15.563)	(2.358)	(3.113)	(1.042)	
3	-0.277***	0.016***	0.012***	0.007		-0.277***	0.015***	0.012**	0.010	
	(-12.308)	(3.995)	(2.830)	(1.130)		(-11.666)	(3.515)	(2.455)	(1.467)	
Carhart Four-Factor Model										
Year	LI Group					LD Group				
	Intercept	b	s	h	m	Intercept	b	s	h	m
-2	-0.375***	0.008***	0.010***	-0.002	-0.004	-0.370***	0.011***	0.011***	0.003	-0.003
	(-33.566)	(3.300)	(4.645)	(-0.411)	(-1.583)	(-29.993)	(4.318)	(4.068)	(0.513)	(-0.998)
-1	-0.389***	0.011***	0.007***	0.001	-0.001	-0.406***	0.010***	0.006***	0.001	0.002
	(-35.284)	(4.001)	(3.224)	(0.171)	(-0.373)	(-47.568)	(4.405)	(3.132)	(0.364)	(1.254)
1	-0.358***	0.008**	0.010***	0.000	-0.001	-0.346***	0.009*	0.012**	0.000	-0.014
	(-19.941)	(2.313)	(3.155)	(0.003)	(-0.208)	(-10.024)	(1.953)	(2.062)	(0.067)	-(1.464)
2	-0.324***	0.010**	0.013***	0.004	-0.005*	-0.325***	0.008*	0.014***	0.005	-0.005*
	(-15.119)	(2.534)	(3.433)	(0.660)	(-1.748)	(-14.729)	(1.821)	(3.493)	(0.788)	-(1.708)
3	-0.272***	0.013***	0.013***	0.006	-0.005	-0.272***	0.013***	0.013***	0.009	-0.004
	(-11.923)	(3.105)	(3.182)	(0.947)	(-1.415)	(-11.405)	(2.779)	(2.839)	(1.316)	-(1.272)

(Table 24 cont.)

Panel B. Results using value-weighted market index										
Fama-French Three Factor Model										
Year	LI Group					LD Group				
	Intercept	b	s	h		Intercept	b	s	h	
-2	-0.376***	0.007***	0.005**	-0.002		-0.373***	0.013***	0.003	0.005	
	(-38.455)	(3.308)	(2.250)	(-0.492)		(-31.527)	(4.287)	(1.026)	(0.972)	
-1	-0.383***	0.009***	0.003	-0.003		-0.388***	0.008***	0.004*	-0.003	
	(-41.143)	(3.044)	(1.589)	(-0.866)		(-40.975)	(3.315)	(1.733)	-(0.849)	
1	-0.347***	0.007*	0.006*	-0.004		-0.355***	0.014*	0.007	0.006	
	(-21.716)	(2.035)	(1.899)	(-0.846)		(-14.995)	(1.900)	(1.230)	(0.901)	
2	-0.310***	0.011***	0.009**	0.001		-0.315***	0.009*	0.006	0.003	
	(-15.225)	(2.873)	(2.220)	(0.150)		(-15.464)	(1.889)	(1.493)	(0.472)	
3	-0.265***	0.014***	0.009***	0.002		-0.269***	0.015***	0.004	0.005	
	(-12.575)	(4.097)	(2.706)	(0.405)		(-11.242)	(3.482)	(0.850)	(0.776)	
Carhart Four-Factor Model										
Year	LI Group					LD Group				
	Intercept	b	s	h	m	Intercept	b	s	h	m
-2	-0.371***	0.006***	0.005***	-0.004	-0.004	-0.370***	0.013***	0.004	0.003	-0.002
	(-34.310)	(3.202)	(2.814)	(-1.022)	(-1.456)	(-29.168)	(4.118)	(1.168)	(0.535)	(-0.771)
-1	-0.384***	0.009***	0.003	-0.003	0.001	-0.396***	0.009***	0.003	-0.002	0.005
	(-33.881)	(3.266)	(1.425)	(-0.778)	(0.231)	(-43.533)	(4.199)	(1.334)	-(0.447)	(2.278)
1	-0.348***	0.007**	0.006*	-0.003	0.001	-0.338***	0.009**	0.009	0.003	-0.011
	(-19.748)	(2.181)	(1.771)	(-0.737)	(0.326)	(-9.957)	(1.960)	(1.359)	(0.453)	-(1.128)
2	-0.306***	0.010**	0.009*	0.000	-0.003	-0.315***	0.008*	0.006	0.003	0.000
	(-14.404)	(2.475)	(2.359)	(-0.025)	-(0.928)	-(14.609)	(1.815)	(1.475)	(0.447)	-(0.072)
3	-0.263***	0.013***	0.010***	0.002	-0.002	-0.265***	0.013***	0.005	0.004	-0.004
	(-12.060)	(3.368)	(2.648)	(0.291)	-(0.607)	-(11.196)	(2.792)	(1.120)	(0.623)	-(1.336)

* significant at the 0.1 level
** significant at the 0.05 level
*** significant at the 0.01 level

LD bidders that make public takeovers do not have significantly decrease in their industry-adjusted stock returns one year after the completion of the takeovers. This result is puzzling.

Table 24 shows the long-term abnormal stock return tests for the LI and LD groups. In Panel A, I show the results using the Fama-French three factor model and Carhart four factor model with equally-weighted market index. In Panel B, I display the results using the Fama-French three factor model and Carhart four factor model with value-weighted market index.

In both Panel A and Panel B, I find that the alphas are significantly negative for both the LI and LD groups before and after the takeovers. And there are no significant differences in changes of alphas between the LI and the LD groups. This result is very similar to the results displayed in Table 22. In summary, I do not document any significant difference in stock returns between the LI and the LD groups. The negative alphas documented here are consistent with the findings of Moeller, Schlingemann and Stulz (2005). A large majority of the acquisitions in my sample are announced between 1998 and 2001. Moeller, Schlingemann and Stulz find that acquisitions announced in 1998-2001 destroy shareholders' wealth on a massive scale and bidders that make these deals have significant underperformance in the long run.

3.4.3 Comparison of Changes in Operating Performance for LI and LD Groups

I report the results of operating performance tests in Table 25. Researchers have used different operating performance measures so far. For robustness, I examine six different measures of operating performances in this essay and report the result of each measure in a different panel. Panel A (Panel B) reports the results of operating income before depreciation scaled by assets (sales), Panel C (Panel D) reports the results of operating income after depreciation scaled by assets (sales) and Panel E (Panel F) reports the results of net income

scaled by assets (sales). As explained previously operating income before depreciation scaled by sales is the most appropriate measure since it is immune to the mechanical effects of the accounting method (pooling or purchase accounting) and the financing method (cash or equity) of the merger (Heron and Lie, 2002). So, I will focus my analysis in this ROS reported in Panel B (operating performance before depreciation scaled by sales).

Panel B reports the raw, industry-adjusted and industry and pre-performance adjusted ROS (return on sales, measured as the operating income before depreciation scaled by sales) for the LI and LD groups before and after the takeovers. Overall, the results indicate that the LI group has relatively better operating performance than the LD group. Take the industry and pre-performance adjusted measure for example. The ROS is zero to the LI group one year before the takeover. It increases to 0.008 one year after the takeover, with the paired 0.008 increase significantly different from zero. The ROS is also zero to the LD group one year before the takeover. However, it decreases to -0.002 one year after the takeover, with a paired though insignificant -0.003 decrease. The difference in changes between the LI and LD groups are significantly different from zero at the 0.05 level. For the second and third year after the takeover completion, the LI group still has relatively better ROS than the LD group.

The results shown in the other five panels are very similar to the results displayed in Panel B. That is, the LI group has relatively better operating performance than the LD group after the takeovers. For all six different operating performance measures, if we focus on the industry and pre-performance metric, we can see LI group has increases in operating performance one year after the takeover (most of the increases are significantly different from zero), and LD group has decreases in operating performance, and the difference in changes between these two groups are significantly different from zero in most scenarios.

Table 25. Operating Performance

This table presents the raw, the industry adjusted (Clark and Ofek, 1994) and the industry and pre-performance adjusted (Barber and Lyon, 1996) operating performances. For the industry adjusted operating performance, I subtract the median operating performance of all firms with the same first-two-digit SIC codes as the bidder from the bidder's operating performance, and get the medians for each group. For the industry and pre-performance adjusted performance, I find for each bidder a matched firm that has the same first two-digit SIC code as the bidder and has the most similar pre-performance as the bidder. Year –1 is the year before the takeover announcement, and year 1 is the year after the takeover effective date. Panel A presents the raw, industry-adjusted and industry and pre-performance adjusted return on assets, which is defined as the operating income before depreciation divided by ending assets. Panel B presents the return on sales, which is operating income before depreciation divided by sales. Panel C presents return on assets, which is the operating income after depreciation divided by ending assets. Panel D presents return on sales, which is the operating income after depreciation divided by sales. Panel E presents return on assets, which is net income divided by ending assets. Panel F presents return on sales, which is net income divided by sales.

(Table 25 cont.)

Year	Raw			Industry-adjusted			Industry and pre-performance adjusted		
	LI	LD	Difference	LI	LD	Difference	LI	LD	Difference
Panel A: Return on Assets (operating income before depreciation divided by ending assets)									
-3	0.146	0.149		0.033	0.034		0.001	0.011	
-2	0.145	0.151		0.038	0.037		0.000	0.004	
-1	0.151	0.152		0.048	0.047		0.000	0.000	
1	0.131	0.130		0.038	0.029		0.002	0.002	
	-0.022***	-0.028***	0.006**	-0.004**	-0.010***	0.006*	0.002	0.001	0.001
2	0.122	0.120		0.033	0.034		-0.004	-0.004	
	-0.026***	-0.027***	0.001	-0.012***	-0.015**	0.003	-0.004	-0.004	0.000
3	0.118	0.119		0.030	0.032		-0.001	0.015	
	-0.030***	-0.036***	0.006	-0.016***	-0.015***	-0.001	-0.002	0.013	-0.015
Panel B: Return on Sales (operating income before depreciation divided by sales)									
-3	0.122	0.118		0.025	0.029		-0.004	-0.004	
-2	0.126	0.124		0.031	0.034		-0.001	0.000	
-1	0.134	0.136		0.042	0.043		0.000	0.000	
1	0.125	0.115		0.039	0.039		0.008	-0.002	
	0.000***	-0.009***	0.009*	0.006	0.002	0.004	0.008**	-0.003	0.011**
2	0.119	0.117		0.039	0.038		0.002	0.000	
	-0.006***	-0.012***	0.006	0.001	0.005	-0.004	0.002	0.000	0.002
3	0.117	0.110		0.041	0.035		0.003	-0.001	
	-0.013***	-0.014***	0.001	0.000	0.001	-0.001	0.002	-0.001	0.003

(Table 25 cont.)

Year	Raw			Industry-adjusted			Industry and pre-performance adjusted		
	LI	LD	Difference	LI	LD	Difference	LI	LD	Difference
Panel C: Return on Assets (Operating income after depreciation divided by assets)									
-3	0.100	0.101		0.032	0.030		0.003	0.000	
-2	0.099	0.100		0.037	0.038		0.001	-0.003	
-1	0.106	0.102		0.048	0.040		0.000	0.000	
1	0.089	0.075		0.037	0.027		0.004	-0.005	
	-0.020***	-0.031***	0.011***	-0.003**	-0.013***	0.01**	0.006	-0.007	0.013*
2	0.077	0.072		0.035	0.027		-0.001	-0.003	
	-0.029***	-0.030***	0.001	-0.013***	-0.009***	-0.004	0.000	-0.002	0.002
3	0.073	0.074		0.034	0.031		0.003	0.000	
	-0.031***	-0.032***	0.001	-0.014***	-0.016***	0.002	0.003	0.001	0.002
Panel D: Return on Sales (Operating income after depreciation divided by sales)									
-3	0.081	0.082		0.025	0.025		-0.002	0.002	
-2	0.083	0.085		0.030	0.034		-0.002	0.001	
-1	0.091	0.092		0.039	0.039		0.000	0.000	
1	0.080	0.066		0.036	0.034		0.006	-0.001	
	-0.005***	-0.017***	0.012**	0.003	0.000	0.003	0.006**	-0.002	0.008**
2	0.073	0.067		0.032	0.031		0.001	-0.007	
	-0.012***	-0.018***	0.006	0.000	0.005	-0.005	0.000	-0.007*	0.007***
3	0.072	0.066		0.042	0.034		-0.003	-0.001	
	-0.014***	-0.015***	0.001	0.002	-0.001	0.003	-0.002	-0.002	0.000

(Table 25 cont.)

Panel E: Return on Assets (Net income divided by assets)									
-3	0.052	0.049		0.023	0.023		0.002	-0.001	
-2	0.053	0.054		0.029	0.028		0.003	0.001	
-1	0.056	0.054		0.035	0.038		0.000	0.000	
1	0.037	0.027		0.026	0.017		0.002	-0.010	
	-0.022***	-0.035***	0.013***	-0.006***	-0.024***	0.018***	0.001	-0.009**	0.010**
2	0.029	0.026		0.021	0.018		-0.001	0.000	
	-0.024***	-0.038***	0.014*	-0.011***	-0.012***	0.001	-0.001	0.000	-0.001
3	0.029	0.024		0.025	0.019		0.002	-0.008	
	-0.028***	-0.034***	0.006*	-0.010***	-0.019***	0.009	0.001	-0.010	0.011
Panel F: Return on Sales (Net income divided by sales)									
-3	0.042	0.037		0.016	0.015		0.001	0.000	
-2	0.045	0.045		0.021	0.019		-0.001	0.002	
-1	0.049	0.049		0.027	0.032		0.000	0.000	
1	0.031	0.022		0.021	0.014		0.001	-0.001	
	-0.009***	-0.024***	0.015***	0.001	-0.010***	0.011**	0.001	-0.002	0.003
2	0.028	0.021		0.020	0.017		0.002	0.001	
	-0.015***	-0.023***	0.008	-0.001	-0.005*	0.004	0.002	0.000	0.002
3	0.028	0.022		0.027	0.019		0.001	-0.010	
	-0.017***	-0.024***	0.007*	0.000	-0.009*	0.009	-0.001	-0.010***	0.009**

* significant at the 0.10 level
** significant at the 0.05 level
*** significant at the 0.01 level

Results in Table 25 suggest that after the takeovers, the LI group has relatively better operating performance than the LD group in all scenarios. This implies that the LI group enjoys relative more improvement in external monitoring than the LD group, which supports the argument of Holmstrom and Tirole (1993).

3.4.4 Comparison of Changes in Bidders' Tobin's Q, Blockholder/Institutional Holdings

I present the results of changes in Tobin's Q between the LI and the LD groups in Table 26.

The industry-adjusted Tobin's Q for the LI group goes from 0.103 one year before the takeover to -0.032 one year after the takeover. The industry-adjusted Tobin's Q for the LD group changes from 0.088 to -0.191 in the corresponding period, with a significant decrease of -0.259. The test further shows that the LD group has significantly greater decrease in Tobin's Q than the LI group. If I examine the raw Tobin's Q, results are very similar. Similar to the negative alphas I documented when examining the long-term performance of the LI and the LD groups, the negative industry-adjusted Tobin's Q are also consistent with the findings of Moeller, Schlingemann and Stulz (2005). In short, my results suggest that the LD group has significantly more decreases in Tobin's Q than the LI group. This finding is consistent with the Holmstrom and Tirole (1993) prediction that liquidity has a positive impact on external monitoring.

I report changes in institutional holdings/block holdings of the LI and the LD groups in Table 27. Concentrated shareholdings by institutions or by blockholders can increase managerial monitoring and are treated as two different external monitoring mechanisms (For example, Agrawal and Knoeber, 1996). Holmstrom and Tirole (1993) argue that liquidity improves external monitoring, and thus it is reasonable to expect that the LI group will have more concentrated shareholdings by institutions/large blockholders than the LD group.

Table 26. Tobin's Q

This table presents the raw and the industry adjusted Tobin's Q for the liquidity-improved and the liquidity-decreased bidders. Tobin s Q is measured as the market value of assets divided by the book value of assets. The market value of assets is the sum of the book value of assets at each fiscal year end and the market value of common stocks at the corresponding calendar year end, subtracting the book value of common stock and deferred taxes. The numbers reported are medians or medians of paired differences.

Year	Raw			Industry-adjusted		
	LI	LD	Difference	LI	LD	Difference
-3	1.607	1.582		0.053	0.012	
-2	1.613	1.613		0.064	0.046	
-1	1.665	1.615		0.103	0.088	
1	1.422	1.260		-0.032	-0.191	
	-0.152***	-0.287***	0.135***	-0.111***	-0.259***	0.148***
2	1.324	1.236		-0.104	-0.129	
	-0.232***	-0.277***	0.045	-0.186***	-0.229***	0.043
3	1.323	1.274		-0.138	-0.135	
	-0.267***	-0.257***	-0.01	-0.207***	-0.229***	0.022

* significant at the 0.10 level
** significant at the 0.05 level
*** significant at the 0.01 level

Table 27. Changes in Bidders' Blockholders around the Takeover

This table presents the changes in bidders' block holders /institutional investors around the takeovers. Numbers reported are medians.

Year	LI	LD	Difference	LI	LD	Difference
Panel A: All institutional investors						
	No. of institutional investors			Percentage held by institutional investors		
-1	50	45		46.0	43.3	
+1	70	43.5		55.8	44.7	
Change	13***	2***	11***	0.040***	-0.000	0.040***
Panel B: All blockholders						
	No. of block holders			Percentage held by all blockholders		
-1	2	2		22.15	23.2	
+1	2	3		21.35	26.1	
Change	0	0	0	0	0	0
Panel C: Outside Blockholders						
	No. of outside blockholders			Percentage held by outside blockholders		
-1	2	2		18.5	16.27	
+1	2	2		18.9	19.94	
Change	0	0	0	0.035	2.45**	2.10

* significant at the 0.10 level
** significant at the 0.05 level
*** significant at the 0.01 level

Panel A of Table 27 shows that both the LI group and the LD group has more number of institutional investors after the takeover, but the LI group has significantly more increase in the number of institutional investors than the LD group. Furthermore, the institutional holdings of the LI group increases from 46 percent to 55.8 percent after the takeover, while the institutional holdings of the LD group stays unchanged after the takeovers. This finding suggests that the external monitoring, as measured by the institutional holdings, increases as the liquidity of the firm improves.

I do not find any significant changes in the number of blockholders (blockholdings) for the LI and LD groups. Panel C shows that LD group has significantly more concentrated shares held by outside blockholders after the takeover, but its change is not significantly different from the corresponding change for the LI group. In short, I do not find any significant difference in change of blockholdings between the LI and the LD group[12].

3.4.5 Check for Business Cycle

One puzzling phenomenon in finance is that merger activities are plentiful in some periods and low in others. (Harford 2005, for example). To rule out the possibility that my findings might be driven by merger waves, in Table 28, I divide my sample years into active and inactive merger- activity-year and re-examine the changes in pricing errors and in ROS (operating income before depreciation scaled by sales) in each year respectively.

I obtain the number of mergers and acquisitions that involve a U.S target firm from SDC, and rank the years 1995 to 2001 by the merger activity. The year 1998 is the year that has the most plentiful merger activity while the year 2001 is the year whose merger activity is the lowest.

[12] The availability of blockholder data from WRD limits the number of observations for these tests.

Table 28. Changes in Pricing Errors/Operating Performance in Different Levels of Merger Activity

This table presents changes in pricing errors/1-R2/operating performance for the liquidity-improved and the liquidity-decreased bidders based on various levels of merger activity. I divide the sample by low/high merger activity. I obtain from SDC the number of mergers each year for 1995 to 2001 respectively, examine the changes in each year, and report them year by year from the year of high merger activity to the year of low merger activity[13]. The changes in operating performance refer to the changes in operating income before depreciation divided by sales from year -1 to year 1.

	Year	Changes in Pricing Errors		Changes in Operating Performance	
		LI	LD	LI	LD
1	1998	-0.001***	0.0006***	0.008	-0.004
2	1997	-0.001***	0.0001	0.007	-0.012
3	1999	-0.001***	0.0001	0.013	-0.007
4	1996	-0.001***	0.0011***	0.014*	-0.018
5	2000	-0.001***	0.0002**	0.009	0.004
6	1995	-0.001***	0.0004**	0.000	-0.001
7	2001	-0.000***	-0.0002	0.000	-0.002

* significant at the 0.10 level
** significant at the 0.05 level
*** significant at the 0.01 level

[13] I obtain the number of mergers from SDC, with one restriction: the target is a US target firm. The result is: 1998-15012; 1997-13235; 1999-13139; 1996-12538; 2000-12468; 1995-10923; 2001-8663

I do not find any evidence suggesting that my findings in this essay are driven by merger wave. Actually, I cannot detect any relations between the changes in pricing errors/ROS and the activeness of mergers and acquisitions.

3.4.6 Endogeneity and Causality Issues

Overall, my findings suggest that liquidity improves external monitoring, as shown in the changes in Hasbrouck (1993) pricing errors, and changes in institutional holdings. I also show that the LI group has significantly better operating performance than the LD group, suggesting a positive impact of the improvements in liquidity and in external monitoring on firms' operating performance. Still there are two concerns that need to be addressed.

First, I find a positive relationship between liquidity and external monitoring or operating performance. Holmstrom and Tirole (1993) suggest that the causality runs from liquidity to external monitoring/operating performance. However, it is possible that the causality runs the opposite, though the theory underlying this opposite prediction is weak. One way to distinguish these two opposing predictions is to see whether the changes in liquidity lead the changes in external monitoring/operating performance. The research design and results in this essay suggests that the causality runs from operating performance to liquidity. The changes in liquidity detected are in the window (1, 80) after the effective date of the takeover, but the changes in operating performance are in the first three fiscal years after the effective date of the takeover. The changes in liquidity precede the changes in operating performance.

Another concern is the possibility that the same factors which lead to the changes in liquidity also lead to the changes in external monitoring and operating performance. I examine this problem in Table 29.

Table 29. Determinants of Changes in Pricing Errors and Changes in Operating Performances

This table presents of the results of examining the determinants of changes in pricing errors and changes in operating performances. In particular, I use 2sls to examine the following regression

$$\Delta performance / pricingerrors = control\ \text{var}iables + \Delta liquidity$$

where $\Delta liquidity = f(\det er\ \min ants)$

The control variables include bidder size change and a dummy of whether the acquisition is related. The determinants or the instrumental variables for changes in liquidity include method of payment (1 if it is cash takeover, and 0 otherwise), whether the target is a public listed firm (1 if the target is public listed and 0 otherwise), changes in trading volume, changes in analysts' coverage, changes in number of market makers, changes in price and deal value. Changes in operating performance are the changes in operating income before depreciation divided by sales from year -1 to year 1.

	Changes in Pricing Errors	Changes in Operating Performance
Intercept	-0.013***	-0.245*
	(-3.69)	(-1.63)
Changes in Relative Spreads	0.0065**	-0.372***
	(2.34)	(-2.68)
Bidder Size	0.002***	0.033
	(3.43)	(1.33)
Same Industry	-0.001	0.197***
	(-0.36)	(2.62)
Public	-0.066**	-0.090**
	(-2.14)	(-2.23)
Method of Payment_Cash	0.022	0.042
	(0.80)	(1.17)
Log Δ # Analysts	-0.075*	-0.05
	(-1.93)	(-0.98)
Log Δ # Market Makers	-0.288***	-0.239***
	(-7.47)	(-4.31)
Log Δ Trading Volume	-0.109***	-0.130***
	(-5.10)	(-4.21)
Log deal value	-0.020**	-0.022*
	(-2.15)	(-1.84)
Log Δ Price	-0.406***	-0.341***
	(-9.98)	(-6.22)
Adjusted R-square	0.027	0.043
Number of Observations	545	325

* significant at the 0.10 level
** significant at the 0.05 level
*** significant at the 0.01 level

In essay one, I find that the improvements in liquidity is driven by changes in firm characteristics for successful bidders after they complete their takeovers, such as changes in number of market makers, changes in number of analysts etc. In Table 29, I include these variables as instrumental variables for changes in liquidity, and examine cross-sectionally the relation between changes in operating performance (in pricing errors) and changes in liquidity using 2SLS. In particular, the 2SLS is designed as:

$$\Delta performance / pricingerrors = control\ \text{var}iables + \Delta liquidity$$

where $\Delta liquidity = f(\det er \min ants)$

The control variables include change in bidder size and a dummy of whether the acquisition is related. The determinants or the instrumental variables for changes in liquidity include method of payment, whether the target is a public listed firm, changes in trading volume, changes in analysts' coverage, changes in number of market makers, changes in price and deal value.

shows that cross-sectionally, changes in liquidity have a significant impact on both changes in pricing errors and changes in operating performance. Particularly, changes in pricing errors are significantly positively related with changes in liquidity. The more improvements in liquidity, the lower the pricing errors. Changes in operating performance are also significantly related with changes in liquidity. Improvements in liquidity significantly improve bidders' operating performances. Furthermore, results in Table 10 are also consistent with my findings in essay one of the determinants of changes in liquidity.

In summary, the results shown in Table 29 support the prediction of Holmstrom and Tirole (1993) that improvements in liquidity lead to improvements in external monitoring, as measured by changes in Hasbrouck (1993) pricing errors, and improvements in operating performance.

3.5 Conclusions

Though theories (Holmstrom and Tirole, 1993) suggest that greater liquidity leads to more active market monitoring, to my knowledge, no one has empirically test these predictions yet. I seek to fill in this void in this essay. In particular, I examine empirically the relation between changes in liquidity and changes in stock price informativeness, and the relation between changes in liquidity and changes in operating performances/firm value/institutional holdings. I find that improvements in liquidity lead to improvements in the firm's price informativeness and the firm's operating performances. In addition, I also find that liquidity has a positive impact on institutional holdings, which is another proxy for external monitoring. My findings are not influenced by the business cycle/merger waves. In sum, results in this essay support the predictions of Holmstrom and Tirole that liquidity improves external monitoring.

Second, extant literature has examined the discipline effect of corporate control on the bidder mainly from the management turnover perspective. This essay examines the discipline effect of corporate control on the bidder from a different perspective - monitoring from the stock market.

Third, evidences from this essay could also shed light on the mixed results of post-takeover performance. Not all takeovers have improvements in liquidity, and if liquidity influences a firm's performances through market monitoring, then the effect of takeovers on the bidder's post-takeover performance will naturally differ.

Chapter 4 Liquidity and Corporate Governance: An Examination of Changes in Corporate Governance for Successful Bidders

4.1 Introduction

In this essay, I examine the relation between liquidity and corporate governance. My analysis is motivated by competing theoretical predictions. Bhide (1993) argues that liquidity hinders effective corporate governance and discourages internal monitoring because unhappy shareholders can more easily sell their shares. His argument suggests that a less liquid stock forces large unhappy shareholders to hold on to their investments and to take actions to improve the company's performance. In contrast, Maug (1998) derives an equilibrium, in which a large shareholder does not have enough initial stake (in the sense that the capital gain on this initial stake does not cover his cost of monitoring) and part of his incentive to monitor depends on his ability to purchase more shares at a price that does not yet reflect the large shareholder's improvements. Additionally, based on Holmstrom and Tirole (1993), liquidity could influence a company's internal monitoring mechanisms by improving the information content of the stock price.[14] A more informative price enables the firm to design more efficient compensation contracts.

I examine two research questions: (1) Does improvement in liquidity lead to more efficient managerial contracts for the company, implying a better internal monitoring? (2) Does improvement in liquidity lead to a more efficient corporate board, which also implies better corporate internal governance? To shed light on these questions, I study changes in governance characteristics and executite compensation for two samples of bidders in successful acquisitions,

[14] In essay two, I find that liquidity improves the information content of a company's stock price.

one in which liquidity improves after the acquisition (LI group) and another in which liquidity decreases (LD group).

Examining 332 acquisitions from April 1, 1995 to December 31, 2001, I find that the absolute cash compensation increases significantly for the LI eroup. For the percentage of each form of compensation to the total compensation, I find that the LI group has significantly greater cash compensation and significantly smaller equity-based compensation. I also find that the pay-for-performance sensitivities of executive compensation, measured as the incentive-intensity of stock options awards and mix of stock option award to cash compensation, decline significantly for the LI group after the acquisitions. These findings support the proposition that liquidity improves the information content of the firm's stock price, which enables the firm to design more efficient compensation contracts (Holmstrom and Tirole, 1993). As liquidity improves, the stock price becomes more informative and reflects the manager's actions more quickly, which makes the firm more transparent. Thus, the findings that LI executives receive more cash and lower PPS appear to support the notion that the need to tie compensation to stock price performance relates inversely to the ability to observe the manager's actions (e.g., Holmstrom, 1979; Shavell, 1979). These results also seem to be compatible with an equilibrium that results from a bargaining framework. Presumably, as a firm becomes more transparent, managers can consume fewer perquisites. In this case, they will bargain for more cash. Additionally, Hermalin (2005) suggests that CEOs who are monitored more intensely will bargain for higher compensation.

For the LD group, I find that their absolute cash, stock and total compensation all decrease significantly after the takeovers. The changes in pay-for-performance sensitivity measures are mixed. The pay-for-performance sensitivity measured as the incentive-intensity of stock option

awards decrease significantly while the pay performance sensitivity measured as the mix of stock option award to cash compensation increases significantly.

I do not find significant differences between changes in board characteristics of the LI and the LD groups. I do not find many significant changes in the compensation packages for directors of the LI and the LD groups either. In sum, although the results of my study suggest that liquidity improve contracting, I do not find support for the premise that it influences internal monitoring.

The subject of corporate governance has attracted much attention recently. Most researchers examine corporate governance from an agency perspective –the separation of ownership and management. Effective corporate governance is believed to be able to align the incentives of the managers to those of the shareholders, and incentive contracts and board of directors are two important mechanisms in building effective corporate governance. Researchers have extensively examined the factors that influence the efficacy of incentive contracts and board of directors. However, I am not aware of any empirical examination of the impact of liquidity on corporate governance. My paper seeks to fill in this void.

In addition to providing evidence on the relation between liquidity and corporate governance, my findings improve our understanding of the characteristics of evolving corporate governance. Kini, Kracaw and Mian (2004) find that internal control mechanisms become more prominent and more effective in the recent years, and the takeover market plays a reduced role in disciplining management. Holderness, Kroszner and Sheehan (1999) find that managerial ownership of publicly traded firms in 1995 is higher than that in 1935. They argue that lower volatility and greater hedging opportunities are two important factors in explaining the increase in managerial ownership. This essay suggests that the improvement in liquidity associated with

the development of the U.S. financial markets (e.g., changes in tick size, requirements on more disclosure, etc) could also be a factor.

The remaining of this essay is organized as follows. Section 2 describes the methods. Section 3 discusses the empirical results and section 4 concludes.

4.2 Data

I obtain the LI and the LD groups from my dissertation essay 2. I obtain executive compensation data and board compensation data from the Standard & Poor's ExecComp database. I collect data on each executive's salary, bonus, the value/number of stock options granted, the value of restricted stocks granted, market price of the company's stock on the date the option was granted, and the executive's ranking within the company by his salary and bonus. I collect data on the annual cash retainer to each director, the fee paid for each meeting attended, the number of meeting, the number of stocks granted and the number of options granted.

I obtain the director characteristics data from the Investor Responsibility Research Center (IRRC) director data. For the firms that are not covered by the IRRC, I collect its board information from the company's proxy statements. In addition, I collect the governance-index data (Gompers, Ishii and Metrick, 2003) from the IRRC governance data.

4.3 Methods

4.3.1 Executive Compensation

4.3.1-1 Compensation Compositions

I examine and compare the compensation compositions for the LI and the LD groups. I examine and compare changes in cash, restricted stocks, stock options, equity-based compensation and total compensation between the LI and the LD groups. I examine these

changes in both the absolute level and the relative level. In addition, to be comprehensive, I study the compensation packages for both the CEOs and other top executives of each company.

My sample includes takeovers from 1995 to 2001, a period when the use of equity-based compensation for US CEOs/executives increased significantly. To control for the trend effect, I identify an industry- and size- matched control firm for each firm in the sample. To construct this control sample, I first identify firms that have the first two-digit SIC code as the sample firm. Among these firms, I mark the firms whose size lies within 30% of the sample firm, and then choose among these firms one control firm with the most similar size. If no control firm can be obtained using this method, I use one digit SIC code to identify firms that are in the same industry as the sample firm, mark the firms whose size lies within 30% of the sample firm, and choose one control firm with the most similar size. If still no control firm can be obtained, I choose the control firm as the one that has the same first two-digit SIC code as the sample firm and is closest in size as the sample firm[15].

In examining the compensation compositions of CEOs and other top executives, I examine the restricted stocks and stock options awards separately because though both awards are equity-based, there are important differences between these two instruments. Stock option awards do not affect earnings (since they are almost all granted at the money), but restricted stock awards result in compensation expenses. Stock options are typically not dividend protected, while restricted stock provides CEOs with dividend rights (Kole, 1997). More importantly, since the value of stock options is convex in stock price and the value of restricted stocks is linear in stock price, these two instruments influence the behaviors of risk-averse managers differently.

[15] Johnson, Ryan and Tian (2004) examine the potential problems with using matches that are outside the 30% bounds and find that results are qualitatively similar if they use only matches that are inside the 30% bounds.

As Ryan and Wiggins (2001) point out, with restricted stock awards, CEOs are likely to give up value-increasing risky projects and therefore lead to an underinvestment problem.

4.3.1-2 Pay-for-Performance Sensitivity: Stock Options and Restricted Stocks

I apply the methods of Bryan, Hwang and Lilien (2000) and calculate the pay-for-performance sensitivity measures of new stock option awards and new restricted stock awards of the LI and the LD groups. These pay-for-performance sensitivity measures are calculated using the equity awards data for the particular year only (flow data). I estimate the incentive-intensity of stock options awards, the mix of stock option awards, the incentive-intensity of restricted stock awards, and the mix of restricted stock awards of the top executives/CEOs. I control for industry and size when examining these pay-for-performance sensitivity measures.

Bryan, Hwang and Lilien (2000) measure the incentive intensities provided by annual CEO stock option awards as the change in stock option awards per $1,000 change in market value of equity.

Incentive-Intensity of Stock Option Awards=

$$\left(\frac{\partial \text{Option}_{\text{share}}}{\partial \text{P}}\right) \times \left(\frac{\text{Number of Options Granted}}{\text{Number of Shares Outstanding}}\right) \times \$1{,}000$$

When calculating the partial derivative of stock options, I assume that the option has a 7-year time to maturity. Most options have a stated life of 10 years, but executives seldom wait till the expiration date to exercise their options. So, following the method described in ExecComp, I reduce the stated life of 10 years by 30% and assume that the executive option has a 7-year time to maturity.

$$\text{Mix of Stock Option Awards} = \frac{(\text{Option}_{\text{share}} \times \text{Number of Options Granted})}{\text{Salary plus Bonus}}$$

This measure calculates the relative use of stock option awards to cash compensation. Cash compensation is calculated as the sum of salary and bonus. Option value is the Black-Scholes' option value.

For restricted stocks, following Bryan et al. (2000), I measure the Incentive-Intensity as $(\frac{\partial RestrictedStock_{share}}{\partial P}) \times (\frac{\text{Number of Options Granted}}{\text{Number of Shares Outstanding}}) \times \$1{,}000$.

Since the restricted stock is always granted at the stock price on the grant date, therefore, the partial derivative of restricted stock price to stock price equals to 1. As a result, Incentive-Intensity of Restricted Stock Grants

$$= \frac{\text{Number of Restricted Stocks Granted}}{\text{Number of Shares Outstanding}} \times \$1{,}000$$

Finally, I calculate the relative use of restricted stock awards to cash compensation as: Mix of Restricted Stock Awards= $\frac{\text{Fair Value of Restricted Stocks Awarded}}{\text{Salary plus Bonus}}$

Similar to the reasons expressed above, I calculate the pay-for-performance sensitivity measures for stock options and restricted stocks separately because their monitoring or incentive effects are not exactly the same, especially to companies with greater investment opportunities. To calculate them separately can help us understand the relation between liquidity and compensation better.

As I mentioned above, I calculate the pay-for-performance sensitivities using the flow data, that is, I only use the equity awards data for the particular year to estimate the pay-for-performance sensitivities. I do not use the executive's total stock and option portfolio data to estimate these pay-for-performance sensitivities. In this essay, I examine the effect of the change in liquidity on executives' pay-for-performance sensitivities. What I am interested in is

how changes in liquidity influence bidders' behavior/methods in awarding their executives. Therefore, to examine the flow data is more suitable

4.3.2 Board Characteristics

4.3.2-1 Board Characteristics

I examine the changes in the board characteristics for the LI and LD groups to see whether liquidity has an impact on the effective board governance. The characteristics I examine include: board size, percentage of insider directors on the board, the number of board meetings, the number of board committees, and whether the CEO is also the chairman of the board and. It has been argued that small boards of directors are more effective. Lipson and Lorsch (1992) argue that as board size increases, directors become more reluctant to criticize top managers' policies and to carry candidate discussions. Jensen (1993) argues that "when boards go beyond seven or eight people they are less likely to function effectively and are easier for CEO to control". Yermack (1996) document an inverse relation between board size and firm value. It is also believed that a board with more independent directors performs more effectively[16]. Weisbach (1988) reports that CEO turnover is more closely related with firm performance when outside directors dominate the firm's board. Hermalin and Weisbach (1989) find that after a firm performs poorly, an outside director is more likely to join the board. Rosenstein and Wyatt (1990) find significant positive share price reactions surrounding outside director appointments. Furthermore, Vafeas (1999) finds that board activity, measured by board meeting frequency, also measures the board efficiency. In addition, the number of board committees/whether the CEO chairs the board also influence the board effectiveness, though their net effect is still an empirical question.

[16] Some extant literature document that a board with fewer insider director actually has lower value than those that have more insider directors.

4.3.2-2 Compensation Packages of Board of Directors

Ryan and Wiggins (2004) examine the relations between director compensation and board-of-director independence. They find that directors' compensations are more closely tied with shareholders' interests when the board is more independent. They also find that an independent board is associated with weaker manager power. From Ryan and Wiggins, it is reasonable to argue that the structure of director compensation could reflect the level of internal monitoring, though it is also influenced by other firm characteristics factors, as market-to-book ratio. Therefore, in addition to examining the board characteristics of the LI and the LD groups, I also examine the director compensation package for the bidders.

I examine and compare changes in annual cash retainer to each director, fee paid per meeting to each director, value of stocks grants to all directors and value of option grants to all directors for the LI and the LD groups. I control for industry and size when examining these changes.

4.3.3 Other Measures

I examine and compare changes in director stock holdings of the LI and the LD groups. I examine and compare changes in the Governance-index (Gompers, Ishii and Metrick 2003) for the LI and the LD groups. Gompers, Ishii and Metrick use the incidence of 24 governance rules and construct a "Governance-Index" to proxy for shareholder rights. The 24 governance rules include the governance provisions as golden parachutes, poison pills, cumulative voting etc. Gompers et al. argue that the higher the Governance-Index, the lower the protection shareholders of that company obtain.

4.4 Empirical Results

4.4.1 CEO/Top Executives' Compensation Packages

Table 30 exhibits industry and size adjusted (in the following, I use adjusted to represent for industry and size adjusted) changes in CEO compensation compositions between the LI and the LD groups. Panel A presents changes in absolute dollar value of each form of compensation for CEOs and Panel B presents changes in the percentage of each form of compensation. I report both medians and means in Table 30. The values reported in the parenthesis are means. For ease of exposition, I discuss medians but the results of the means are actually similar.

For the LI group, Panel A shows that its adjusted cash compensation is $89,448 before the takeover. It increases significantly to $174,087 after the takeover. For the absolute restricted stock, option and total compensation, the LI group has increases, though not significant, in all of them. In results not reported, I examine changes in the unadjusted compensations for the LI group. I find that the LI group has significant increases in all forms of compensations. For example, it has a significant increase of $355,962 in its total compensation. Panel B shows that as a percentage of total compensation, the cash compensation for the LI group increases significantly (a significant increase of 1.899%) after the takeover while the equity-based compensation decreases significantly (a significant decrease of 1.899%).

The findings for the LI group support Holmstrom and Tirole (1993). Holmstrom and Tirole (1993) argue that liquidity improves the information content of the stock price, and a more informative price system enables the firm to design more efficient compensation contracts. I find that price becomes more informative for the LI group after the acquisitions, therefore its price becomes more sensitive to mangers' behaviors. Holmstrom (1979) and Shavell (1979) show that

Table 30. Changes in CEO Compensation Package

This table exhibits industry and size adjusted changes in CEO compensation compositions between the LI and the LD groups. Panel A presents changes in absolute dollar value of each form of compensation for CEOs while Panel B presents changes in the percentage of each form of compensation. I report both median and mean in this table. The values reported in the parenthesis are means.

	LI Group			LD Group			Difference in
	Before	After	Change	Before	After	Change	Change
	Panel A: Absolute dollar value of each form of compensation (thousand)						
Cash compensation	89.448 (79.154)	174.087 (318.493)	139.665*** (239.339**)	61.139 (9.495)	-53.558 (-141.994)	-136.561** (-151.488)	276.226*** (390.827***)
Restricted stock awards	0.000 (37.833)	0.000 (-16.520)	0.000 (-54.353)	0.000 (4629.821)	0.000 (-187.951)	0.000 (-4817.771)	0.000 (4763.418)
Stock option awards	96.579 (964.385)	51.365 (1408.552)	31.615 (436.653)	479.221 (2092.733)	86.198 (-112.696)	-915.843*** (-2205.429***)	947.458*** (2642.082***)
Equity-based compensation	183.340 (1002.218)	180.829 (1381.322)	31.615 (374.215)	500.971 (6722.554)	257.801 (-300.646)	-987.962*** (-7023.201*)	1019.577*** (7397.416***)
Total compensation	288.639 (1081.372)	372.015 (1696.874)	58.329 (613.744)	594.926 (6732.049)	106.647 (-442.640)	-1168.820*** (-7174.689*)	1227.149*** (7788.433***)
Number of Observations	215	215	215	117	117	117	

(Table 30 cont.)

	LI Group			LD Group			Difference in
	Before	After	Change	Before	After	Change	Change
	Panel B: Percentage of each form of compensation to total compensation (%						
Cash compensation/total compensation	-9.774 (-6.256)	0.000 (0.873)	1.899* (7.143***)	-17.452 (-14.357)	-3.310 (-3.297)	6.092*** (10.786***)	-4.193** (-3.644**)
Restricted stock awards/total compensation	0.000 (0.282)	0.000 (-2.071)	0.000 (-2.215*)	0.000 (2.442)	0.000 (0.375)	0.000 (-2.064)	0.000 (-0.151)
Stock option awards/total compensation	4.341 (5.974)	0.551 (1.198)	-0.541* (-4.927)	12.386 (11.914)	4.267 (2.922)	-6.092*** (-8.722***)	5.551** (3.795**)
Equity-based compensation/total compensation	9.774 (6.256)	0.000 (-0.873)	-1.899* (-7.143***)	17.452 (14.357)	3.310 (3.297)	-6.092*** (-10.786***)	4.193* (3.644*)
Number of Observations	215	215	215	117	117	117	

* significant at the 0.1 level
** significant at the 0.05 level
*** significant at the 0.01 level

in this case (when the agent's actions are more observable), the optimal contract is to pay with cash.

For the LD group, its adjusted absolute cash compensation decreases significantly of $136,561, and this change is significantly different from the change in the LI group. The LD group also has significant decreases in other forms of compensation. Its total adjusted compensation decreases at $1,168,820. As a percentage of total compensation, the LD group has significant increases in cash and significant decrease in equity. These findings are puzzling.

Table 31 displays industry and size adjusted changes in top executives' compensation packages between the LI and the LD groups. Top executives here refer to the Top 5 executives in terms of total cash compensation in each company (salary plus bonus). Therefore, for firms with fewer than 5 executives' compensation data available in ExecComp, I include all of them in analysis; for firms with more than 5 executives' compensation data available, I only include the data of the top 5. In addition, I include in analysis those executives whose rank in terms of cash compensation is not disclosed in ExecComp. Panel A presents changes in the absolute dollar value of each form of compensation while panel B presents changes in the relative level of each form of compensation.

Overall, results of changes in top executives' compensation tell a similar story as changes in CEO's compensations. At the level of absolute compensation, LI group has significantly increases in the cash compensation but the LD group does not. The equity-based compensation of LI group, on average, stays similar, while the equity-based compensation of LD group decreases significantly after the takeovers. At the percentage level of each form of compensation, the LI group has no significant change after the takeovers, but the LD group has a significant

Table 31. Changes in Top Executives' Compensation Package

This table displays industry and size adjusted changes in top executives' compensation packages between the LI and the LD groups. Top executives here refer to the Top 5 executives in terms of total cash compensation in each company (salary plus bonus). Therefore, for firms with fewer than 5 executives' compensation data available in ExecComp, I include all of them in analysis; for firms with more than 5 executives' compensation data available, I only include the data of the top 5. In addition, I include in analysis those executives whose rank in terms of cash compensation is not disclosed in ExecComp Panel A presents changes in the absolute dollar value of each form of compensation while panel B presents changes in the relative level of each form of compensation. The values reported in the parenthesis are means.

	LI Group			LD Group			Difference in
	Before	After	Change	Before	After	Change	Change
	Panel A: Absolute dollar value of each form of compensation (thousand)						
Cash compensation	46.274	101.335	22.073**	12.427	-15.255	-64.450	86.523***
	(81.101)	(154.235)	(73.134**)	(-1.153)	(-33.283)	(-32.130)	(105.264***)
Restricted stock awards	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(36.771)	(8.106)	(-28.665)	(824.853)	(-109.533)	(-934.385)	(905.720)
Stock option awards	46.895	94.140	6.246	174.340	71.882	-302.392***	308.638***
	(219.687)	(494.945)	(276.244)	(742.194)	(-310.985)	(-1053.179***)	(1329.423***)
Equity-based compensation	81.485	96.346	18.298	214.889	75.099	-418.265***	436.563***
	(255.726)	(510.043)	(252.265)	(1864.068)	(-427.222)	(-2291.290**)	(2543.555***)
Total compensation	110.432	167.305	31.855	206.980	130.115	-466.430***	498.285***
	(333.230)	(668.096)	(336.114)	(1864.125)	(-458.641)	(-2322.766**)	(2658.881***)
Number of Observations	1927	1927	1927	1060	1060	1060	

(Table 31 cont.)

	LI Group			LD Group			Difference in
	Before	After	Change	Before	After	Change	Change
	Panel B: Percentage of each form of compensation to total compensation (%)						
Cash compensation/total compensation	-4.969	0.486	4.940	-13.753	-4.168	3.834***	1.106
	(-3.543)	(-0.727)	(3.133)	(-10.260)	(-3.140)	(7.121***)	(-3.987)
Restricted stock awards/total compensation	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.350)	(-1.559)	(-2.003**)	(1.393)	(0.252)	(-1.140)	(-0.862)
Stock option awards/total compensation	4.050	6.022	0.608	9.467	4.679	-1.081**	1.689*
	(3.193)	(2.286)	(-1.131)	(8.868)	(2.887)	(-5.980**)	(4.849*)
Equity-based compensation/total compensation	4.969	-0.486	-4.940	13.753	4.168	-3.834***	-1.106
	(3.543)	(0.727)	(-3.133)	(10.260)	(3.140)	(-7.121***)	(3.987)
Number of Observations	1927	1927	1927	1060	1060	1060	

* significant at the 0.1 level
** significant at the 0.05 level
*** significant at the 0.01 level

increase in the percentage of cash compensation (a significant increase of 3.834) and a significant decrease in percentage of stock option awards percentage.

Table 32 displays the adjusted changes in executives' pay-for-performance sensitivities for the LI and the LD groups after the acquisitions. Panel A presents the results for the CEO's pay-for-performance sensitivities while Panel B presents the results for the top executives' pay-for-performance sensitivities.

Panel A of Table 32 shows that after the acquisitions, the pay-for-performance sensitivity, measured as the incentive-intensity of stock option awards and the mix of stock option award to cash compensation, decreases significantly for the LI group. The Incentive-Intensity of Stock Option Award decreases from 0.707 to 0.045 and the Mix of Stock Option Award to Cash Compensation decreases from 0.324 to 0.115. The changes of the pay-for-performance sensitivity measures for the LD group are mixed. Its incentive-intensity of stock option awards decreases significantly but its mix of stock option award to cash compensation increases significantly. I do not observe many significant differences in changes between the LI and the LD groups except for the Mix of Stock Option Award to Cash Compensation. The LI group has a significant decrease of -0.181 while the LD group has a significant 0.202 increase after the acquisition. Furthermore, the 0.202 increase for the LD group is significantly different from the -0.181 decrease for the LI group.

4.4.2 Board Characteristics and Board Compensation

Table 33 exhibits changes in board characteristics, director stock holdings and governance-index (Gompers, Ishii and Metrick 2003) of the LI and the LD groups from one year before the announcement date of the takeover to one year after the effective date of the takeover.

Table 32. Changes in the Pay-Performance Sensitivities

This table displays the industry and size adjusted changes in executives' pay-performance sensitivities for the LI and the LD groups after the takeovers. Panel A presents the results for the CEO's pay-performance sensitivities while Panel B presents the results for the top executives' pay-performance sensitivities. Incentive-Intensity of Stock Option Awards= $(\frac{\partial \text{Option}_{share}}{\partial P}) \times (\frac{\text{Number of Options Granted}}{\text{Number of Shares Outstanding}}) \times \$1{,}000$;

Mix of Stock Option Awards= $\frac{(\text{Option}_{share} \times \text{Number of Options Granted})}{\text{Salary plus Bonus}}$

Incentive-Intensity of Restricted Stock Grants= $\frac{\text{Number of Restricted Stocks Granted}}{\text{Number of Shares Outstanding}} \times \$1{,}000$

Mix of Restricted Stock Awards= $\frac{\text{Fair Value of Restricted Stocks Awarded}}{\text{Salary plus Bonus}}$

	LI Group			LD Group			Difference
	Before	After	Change	Before	After	Change	in Change
	Panel A: CEO's pay-for-performance sensitivities						
Incentive-intensity of stock option awards	0.707	0.045	-0.777***	1.431	0.272	-0.880***	0.103
	(1.825)	(-0.739)	(-2.564 ***)	(1.075)	(0.496)	(-0.580)	(-1.984)
Mix of stock option award to cash compensation	0.324	0.115	-0.181**	0.347	0.264	0.202**	-0.383***
	(0.559)	(-0.462)	(-1.020*)	(-0.085)	(0.296)	(0.381)	(-1.402)
Incentive-intensity of restricted stock awards	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.008)	(-0.110)	(-0.117)	(0.047)	(-0.061)	(-0.107***)	(-0.010)
Mix of restricted stock award to cash compensation	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.043)	(-0.115)	(-0.158)	(0.064)	(-0.127)	(-0.191**)	(0.033)
Number of Observations	172	172	172	94	94	94	

(Table 32 cont.)

	LI Group			LD Group			Difference
	Before	After	Change	Before	After	Change	in Change
	Panel B: Top executive's pay-for-performance sensitivities						
Incentive-intensity of stock option awards	0.707	0.045	-0.777***	1.064	0.257	-0.812***	0.036
	(1.852)	(-0.683)	(-2.535***)	(1.026)	(0.460)	(-0.566)	(-1.969)
Mix of stock option award to cash compensation	0.313	0.115	-0.181**	0.3140	0.228	0.200**	-0.381***
	(0.492)	(-0.636)	(-1.129**)	(-0.0998)	(0.285)	(0.385)	(-1.514***)
Incentive-intensity of restricted stock awards	0.000	0.000	0.000	0.0000	0.000	0.000	0.000
	(0.010)	(-0.093)	(-0.103)	(0.0480)	(-0.096)	(-0.144**)	(0.040)
Mix of restricted stock award to cash compensation	0.000	0.000	0.000	0.0000	0.000	0.000	0.000
	(0.033)	(-0.118)	(-0.151)	(0.0659)	(-0.130)	(-0.196**)	(0.045)
Number of Observations	1310	1310	1310	769	769	769	

* significant at the 0.1 level
** significant at the 0.05 level
*** significant at the 0.01 level

Table 33. Changes in Board Characteristics, Director Holdings and Governance-Index

This table exhibits changes in board characteristics, as board size, percentage of inside directors, dual CEO/Board Chair, number of committees, number of meetings, and direct stock holdings, of the LI and the LD groups. It also exhibits changes in Governance-Index for the LI and the LD groups. The governance-index is constructed by Gompers, Ishii and Metrick (2003), who use the incidence of 24 governance rules and construct a "Governance-Index" to proxy for shareholder rights.

	LI Group			LD Group			Difference in
	Before	After	Change	Before	After	Change	Change
	Panel A. Changes in board characteristics						
Board Size	9.000	9.000	0.000***	9.000	9.000	0.000	0.000
	(8.724)	(9.034)	(0.310***)	(9.493)	(9.746)	(0.254)	(0.056)
Inside directors	0.200	0.200	0.000	0.226	0.218	0.000	0.000
	(0.255)	(0.242)	(-0.013)	(0.263)	(0.235)	(-0.028***)	(0.015)
Dual CEO/chair	1.000	1.000	0.000	1.000	1.000	0.000	0.000
	(0.663)	(0.694)	(0.031)	(0.755)	(0.623)	(-0.132***)	(0.163)
Committees	3.000	3.000	0.000	3.000	3.000	0.000	0.000
	(3.197)	(3.263)	(0.066**)	(3.321)	(3.346)	(0.025)	(0.041)
Number of meetings	6.000	6.000	0.000	7.000	7.000	0.000	0.000
	(6.635)	(6.833)	(0.197)	(7.262)	(7.786)	(0.524)	(-0.327)
Obs	145	145	145	71	71	71	

(Table 33 cont.)

	LI Group			LD Group			Difference in
	Before	After	Change	Before	After	Change	Change
	Panel B. Changes in director holdings						
Direct Holdings	1053179.000 (6271871.809)	896183.000 (5061389.787)	266931.000* (-1210482.021)	1495429 (3388938.33)	3058788 (8047701.17)	385784** (4658762.8*)	-118853 (-5869244.82)
Obs	47	47	47	18	18	18	
	Panel C. Changes in Governance-Index						
G-Score	8.50 (8.55)	9.00 (9.39)	0.000 (0.839***)	11 (10.45)	11 (10.79)	0.000 (0.345**)	0.000 (0.494)
Obs.	56	56	56	29	29	29	

* significant at the 0.1 level
** significant at the 0.05 level
*** significant at the 0.01 level

The median board size of the LI group is 9 before the takeover and stays the same after the takeover, though the mean board size increases significantly of 0.310. The LD group does not have any significant changes in board size. The difference in changes in board size between these two groups is not significantly different from zero. The percentage of insider directors of the LI group does not change significantly after the takeovers, but it decreases significantly for the LD group in the means. Still, the differences between changes are insignificant. In addition, the mean number of committees of the LI group increases significantly by 0.066 after the takeover. Panel B of Table 33 shows that both the LI group and the LD group have significantly increases in direct stock holdings after the takeover, while the differences in changes between these two groups are not significantly different from each other. When I examine the Governance-Index for these two groups in Panel C, I find that there is no significant difference in changes between the LI and the LD groups.

Overall, I do not observe any significant differences in changes of board characteristics between the LI and the LD groups after the takeovers.

Table 34 presents industry and size adjusted changes in director compensation for the LI and the LD groups.

Panel A shows that the annual cash retainer does not change significantly for the LI and the LD groups after the takeovers. Directors of the LI group get significantly higher pay for their attendance in board meetings, but directors of the LD group receive statistically similar amount of payment for their attendance in board meetings. For example, the adjusted cash from meeting increases from $0 to $600 for the LI group after the takeover, with an increase that is significantly different from zero. Similarly, the total cash compensation increases significantly

Table 34. Board of Director Compensation

This table presents the industry and size adjusted changes in board of director compensation for the LI and the LD groups. Cash from meetings is the produce of fee paid/meeting and meetings of each year. In Panel B, the percentage level of board composition is calculated as the absolute value of each composition divided by the total compensation.

	LI Group			LD Group			Difference
	Before	After	Change	Before	After	Change	in Change
	Panel A: Absolute level of board compensation (thousand)						
Annual Cash Retainer	-2.000	-1.000	0.000	-1.000	0.000	0.000	0.000
	(-2.062)	(-1.405)	(0.657)	(-2.464)	(-2.317)	(0.147)	(0.510*)
Fee Paid/Meeting	0.000	0.000	0.000	0.000	0.150	0.000	0.000
	(0.088)	(0.157)	(0.069)	(-0.037)	(0.000)	(0.037)	(0.032)
Cash from Meeting	0.000	0.600	1.000***	0.900	-0.600	-1.000	2.000***
	(0.754)	(1.872)	(1.136***)	(-0.461)	(-0.193)	(-0.397)	(1.533***)
Total Cash Compensation	-2.000	0.600	1.500	-2.026	-2.875	-2.000	3.500***
	(-1.013)	(0.818)	(2.028**)	(-2.867)	(-3.256)	(-0.697)	(2.725***)
Value of Stock Grants	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(406.156)	(1297.206)	(891.049*)	(455.855)	(7904.954)	(7449.099**)	(-6558.049)
Value of Option Grants	0.000	4.697	4.158*	8.527	5.244	0.000	4.158
	(-25.744)	(13.593)	(50.400)	(16.726)	(4.905)	(-16.659)	(67.059)
Total Equity-based Compensation	7.798	25.268	14.985	20.296	29.472	-9.673	24.659
	(360.210)	(1355.377)	(1004.407*)	(507.948)	(8189.514)	(8059.819**)	(-7055.412)
Total Compensation	11.625	24.085	12.230	24.700	65.275	-14.173	26.403
	(344.287)	(1365.841)	(958.330)	(510.658)	(9231.235)	(9044.406**)	(-8086.076)
Number of Observations	198	198	198	92	92	92	92

(Table 34 cont.)

	LI Group			LD Group			Difference
	Before	After	Change	Before	After	Change	in Change
	Panel B. Percentage level of board compensation (%)						
Annual Cash Retainer	-2.185	-5.348	0.012	-0.226	-0.295	-0.069	0.082
	(-8.385)	(-9.611)	(-1.226)	(-5.344)	(0.465)	(5.809)	(-7.035)
Fee Paid/Meeting	-0.274	-0.014	0.009	-0.002	-0.001	0.001	0.007
	(-0.912)	(-0.672)	(0.240)	(-0.411)	(-0.243)	(0.169)	(0.072)
Cash from Meeting	-1.264	0.000	0.013	-0.027	-0.032	0.000	0.013
	(-4.832)	(-2.992)	(1.840)	(-1.503)	(-1.550)	(-0.047)	(1.887)
Total Cash Compensation	-2.749	-1.265	-0.805	-0.253	-0.327	-0.074	-0.731
	(-13.218)	(-12.603)	(0.614)	(-6.847)	(-1.085)	(5.762)	(-5.148)
Value of Stock Grants	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(7.625)	(4.954)	(-2.671)	(3.479)	(6.949)	(3.470)	(-6.142)
Value of Option Grants	0.000	0.502	1.028	0.280	0.505	0.000*	1.028***
	(5.593)	(7.650)	(2.057)	(3.368)	(-5.864)	(-9.233*)	(11.290***)
Total Equity-based Compensation	2.749	1.265	0.805	0.253	0.327	0.074	0.731*
	(13.218)	(12.603)	(-0.614)	(6.847)	(1.085)	(-5.762)	(5.148*)
Number of Observations	181	181	181	88	88	88	

* significant at the 0.1 level
** significant at the 0.05 level
*** significant at the 0.01 level

for the LI group, but stays similar for the LD group, and the difference in changes between these two groups are significantly different from zero.

Panel B shows that for the LI group, the percentage total equity-based compensation increases insignificantly after the takeover. Still, this increase is significantly greater than the increase in the LD group.

In summary, Table 34 shows that the board of directors of the LI group receives more increases in cash payment than the LD group. It also shows that the LI group has relatively more increases in the percentage of equity-based compensation than the LD group.

4.4.3 Multivariate Analysis

Table 35 presents the results of my multivariate analysis of the adjusted changes in CEO's compensation/pay-for-performance sensitivity measures and changes in liquidity. Panel A presents the results of changes in CEO's compensations. The dependent variables in Panel A include adjusted changes in absolute total compensation, adjusted changes in absolute total equity, adjusted changes in percentage option compensation and adjusted changes in percentage equity compensation. Panel B presents the regression results of adjusted changes in CEO's pay-for-performance sensitivity measures. The dependent variables in Panel B include adjusted changes in incentive-intensity of stock option awards, adjusted changes in mix of stock option award to cash compensation, adjusted changes in incentive-intensity of restricted stock awards and adjusted changes in mix of restricted stock to cash compensation. All the dependent variables are winsorized at the 1% and 99% levels. The liquidity change dummy equals to 1 when the bidder's liquidity improves following the acquisition and 0 otherwise. The same industry equals 1 if the bidder makes a related takeover (the bidder has the same first 2-digit SIC

Table 35 Multivariate Analysis of Changes in CEO'S Compensation

This table presents the regression results of changes in CEO's compensation and in CEO's pay-for-performance sensitivity measures. Panel A presents the regression results of changes in CEO's compensations. The dependent variables in Panel A include changes in absolute total compensation, changes in absolute total equity, changes in percentage option compensation and changes in percentage equity compensation. Panel B presents the regression results of changes in CEO's pay-for-performance sensitivity measures. The dependent variables in Panel B include changes in incentive-intensity of stock option awards, changes in mix of stock option award to cash compensation, changes in incentive-intensity of restricted stock awards and changes in mix of restricted stock to cash compensation. All the dependent variables are winsorized at the 1% and 99% levels. Liquidity change dummy equals to 1 when the bidder has improvements in liquidity and 0 otherwise. Same industry equals to 1 when the bidder has the same first 2-digit SIC code as the target and 0 otherwise. Method of payment equals to 1 when the bidder uses cash as the medium of exchange in the transaction.

Panel A. Changes in CEO's compensations				
	Changes in total equity	Changes in total compensation	Changes in % options grants	Changes in %total equity
Intercept	-1192.693	-2126.614	-0.186	-0.159
	(-0.384)	(-0.661)	(-1.582)	(-1.307)
Liquidity change dummy	3290.226**	3458.822**	0.078	0.079
	(2.495)	(2.535)	(1.557)	(1.515)
Log (deal value)	84.869	223.809	0.019	0.014
	(0.201)	(0.513)	(1.174)	(0.865)
Same Industry	-2443.686*	-2362.522*	0.006	-0.025
	(-1.917)	(-1.792)	(0.131)	(-0.501)
Method of Payment_Cash	-1390.284	-1182.651	-0.014	-0.005
	(-1.080)	(-0.888)	(-0.297)	(-0.095)
R-square	0.037	0.036	0.011	0.014
Number of Observations	323	323	321	321

(Table 35 cont.)

Panel B. Changes in CEO's pay-for-performance sensitivity measures				
	Changes in incentive-intensity of stock option awards	Changes in mix of stock option to cash compensation	Changes in incentive-intensity of restricted stock awards	Changes in mix of restricted stock to cash compensation
Intercept	-2.914	3.677*	-0.245	0.588**
	(-1.559)	(1.889)	(-1.374)	(2.383)
Liquidity change dummy	-1.367	-2.109**	0.117	0.036
	(-1.573)	(-2.330)	(1.413)	(0.315)
Log (deal value)	0.247	-0.525**	0.034	-0.100***
	(0.993)	(-2.025)	(1.441)	(-3.039)
Same Industry	0.188	0.297	-0.202**	-0.115
	(0.216)	(0.327)	(-2.417)	(-1.000)
Method of Payment_Cash	1.020	0.609	0.080	-0.091
	(1.145)	(0.656)	(0.935)	(-0.770)
R-square	0.027	0.045	0.042	0.070
Number of Observations	206	206	206	206

* significant at the 0.1 level
** significant at the 0.05 level
*** significant at the 0.01 level

code as the target) and 0 if unrelated. The method of payment equals 1 when the bidder uses cash as the medium of exchange in the transaction and 0 otherwise.

Panel A of Table 35 suggests that improvement in liquidity has a positive and significant impact on CEO's total equity compensation and total compensation. A liquidity-improved bidder has $3,459,000 ($3,290,000) more increase in total (total equity) compensation than a liquidity-decreased bidder. Panel A also shows that the improvement in liquidity does not have a significant impact on the percentage of equity based compensation. Results of Panel B are consistent with my findings in the univariate analysis. After controlling for other factors, the improvement in liquidity has a significant but negative impact on changes of mix of stock option award to cash compensation. In results not reported, I examine the relation between changes in total cash compensation and liquidity dummy. I find a positive impact of liquidity dummy on cash compensation with a p-value of 0.11.

To check for the robustness of the multivariate results, I replace the "liquidity dummy" variable with the "changes in liquidity" and obtain qualitatively similar results. I also do the regression by replacing the dependent variable with its percentile ranks, and the results are also qualitatively similar.

In sum, results in Table 35 suggest that improvement in liquidity increases the CEO's total compensation, while at the same time reduces the pay-for-performance sensitivities of the CEO's compensation.

4.5 Conclusions

Theoretical results of the liquidity impact on corporate governance are by far ambiguous. This essay examines empirically the influence of liquidity on a company's corporate governance. Particularly, it examines the impact of liquidity on the company's executives' compensation

packages, on the board characteristics of the company and on the compensation packages of the board's directors. Examining 332 acquisitions from April 1, 1995 to December 31, 2001, I find that the absolute cash compensation increases significantly for the LI group. For the percentage of each form of compensation to the total compensation, I find that the LI group has significantly greater cash compensation and significantly smaller equity-based compensation. I also find that the pay-performance sensitivities, measured as the incentive-intensity of stock options awards and mix of stock option award to cash compensation, decline significantly for the LI group after the takeovers. These findings support Holmstrom and Tirole (1993) that liquidity improves efficient contracting and allows the firm to design more efficient compensation contracts. Holmstrom (1979) and Shavell (1979) show that if the agent's actions are perfectly observable, the optimal contract is to pay with cash. When they are not observable, the second best solution is to make the payout sensitive to performance. I find that the stock price of the LI group becomes more informative after the takeovers. The firm's stock price will thus reflect managers' actions more quickly. As a result, for the LI groups, their managers' actions become more observable, and their compensation package consists of more cash.

Second, some recent literature documents that the internal corporate governance has improved over time. For example, Kini, Kracaw and Mian (2004) find that internal control mechanisms become more prominent and more effective in the recent years. Holderness, Kroszner and Sheehan (1999) find that managerial ownership of publicly traded firms in 1995 (21 percent) is higher than that in 1935 (13 percent). What is the reason behind the improvement in the internal corporate governance? This essay suggests that the improvement in liquidity associated with the development of financial markets could also be a factor.

Chapter 5 Conclusions

My dissertation examines the relation between corporate acquisitions, bidders' liquidity and monitoring. It consists of three essays. Essay one examines the effect of corporate acquisitions on bidders' liquidity. I find that on average bidders' liquidity improves after successful takeovers, but stays stable or becomes worse if their takeover attempts fail. Takeovers of public firms result in similar liquidity improvements as do takeovers of private firms, but takeovers of public firms have greater reduction in information asymmetry than takeovers of private firms. Takeovers that use stock as the method of payment have significantly more improvement in liquidity than takeovers that use cash in the transaction. Essay two examines the effect of changes in liquidity on bidders' market monitoring. I find that the price for liquidity-improved bidders becomes more informative after the takeover but the price for liquidity-decreased group becomes less informative. Furthermore, liquidity- improved bidders have relatively better operating performance and higher firm value than liquidity-decreased bidders. Essay three examines the effect of changes in liquidity on bidders' corporate governance. I find that compared to the liquidity-decreased bidders, executives for the liquidity-improved bidders have significantly larger size- and industry-adjusted increases in cash and total compensation after the acquisitions. The pay-for-performance sensitivity of executive compensation decrease significantly for the liquidity-improved bidders.

My results suggest that completed acquisitions improve bidders' liquidity and that changes in firm characteristics associated with acquisitions completion provide the primary impetus for liquidity improvements of bidders. My findings also lend support to Holmstrom and Tirole (1993) that liquidity improves a firm's external monitoring. Furthermore, my results also support the

proposition that an improvement in liquidity results in a more informative stock price that enables a firm to write more efficient contracts.

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Vita

Huihua Li obtained her Bachelor of Economics degree in 1997 from FuDan University in China. She obtained her Master of Economics degree from FuDan University in 2000. In 2004, she got her Master of Science degree in Finance from Louisiana State University. She expects to obtain her Doctor of Philosophy degree in Business Administration with a concentration in Finance from Louisiana State University in August of 2006. During her graduate study at Louisiana State University, Huihua Li taught business finance and investments at the undergraduate level. Her working paper, "Acquisitions and Bidders' Liquidity: Evidence from Successful and Unsuccessful Takeovers", was presented at the Financial Management Association International (FMA) 2005. Her working paper, "Liquidity and Market Monitoring: an Examination of Changes in Market Monitoring for Successful Bidders", is accepted for presentation at the FMA 2006.